FLIGHT
and
AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Flightpres, Sedist, London. Telephone : Waterloo 3333 (50 lines.)

COVENTRY: 8 - 10, CORPORATION ST. Telegrams : Autocar, Coventry. Telephone : Coventry 5210.
BIRMINGHAM, 2: KING EDWARD HOUSE, NEW STREET. Telegrams : Autopress, Birmingham. Telephone : Midland 7191 (7 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams : Iliffe, Manchester. Telephone : Blackfriars 4412.
GLASGOW, C.2: 26B. RENFIELD ST. Telegrams : Iliffe, Glasgow. Telephone : Central 4857

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper

No. 2019. Vol. LII. September 4th, 1947 Thursdays, One Shilling.

The Outlook

Problems—Profound and Profuse

"THE patient efforts of a large number of workers in wind tunnels and in flight during the past forty years have, in large measure, established an understanding of the factors affecting aircraft performance. The rapid developments in aviation during recent years have faced workers all over the world with new problems, and the aircraft designers and experimenters are having to begin the task of establishing the basis of high-speed design all over again."

That sentence, the opening words in Mr. W. G. A. Perring's paper (one of the seven presented yesterday at the joint Anglo-American Aeronautical Conference) sums up the present position admirably. In very truth, designers and research workers are having to begin all over again. And they are much worse off than were their counterparts forty years ago; then the experimenter did his own simple designing, and often his own piloting as well. And when the crash came, as it nearly aways did, so simple was the aircraft structure that repairs took but a few days, or a couple of weeks at the most. Almost any reasonably flat piece of ground served the purpose of airfield, with perhaps a small wooden shed as the combined hangar and workshop.

How different is the picture to-day. The insatiable thirst for speed has driven us into realms where knowledge no longer suffices, and where even the imagination boggles. Before the simplest bit of construction can begin, reams of calculations and acres of drawings have to be laboriously produced, and even then there is no guarantee that the aircraft which has been born in such labour will behave as it should after taking off from a runway of inordinate length, constructed at fantastic cost.

Should we, then, abandon our probing and prying into the problems which lie behind the present veil? To that question no one would answer "Yes," but it is essential to retain a sense of proportion in these things, and there seems to be a danger that we are losing this sense. That is one reason out of many why we welcome the Anglo-American Aeronautical Conference. No one who has the opportunity to attend the lectures or study the printed papers can fail to be impressed by the magnitude and multitude of the problems which confront designers and scientists. While thus the contributions by American and British specialists add to the common fund of knowledge, they also serve as a timely brake on unwarranted optimism.

The curious situation appears to have arisen that scientists know more about the supersonic region than they do about the transonic, yet aircraft will have to fly through the latter twice—accelerating in one case, decelerating in the other. That is a sobering fact which is apt to be too often overlooked, not by designers and scientists, to be sure (they are only too well aware of the formidable obstacles), but by those of the public who believe that it will be but a year or two before the Atlantic is crossed regularly in a couple of hours.

The Radlett Display

WITH the emphasis strongly on export, as it is at the present time, the display organized by the Society of British Aircraft Constructors comes at a very opportune moment. Never was this country more in need of convincing the world that, contrary to widespread opinion abroad, Great Britain is very far from being "finished."

There is, of course, no denying the fact that in certain classes of transport aircraft we have a great deal of leeway to make up—one of the many legacies of the war, but in other respects the aeronautical goods which will be displayed to our foreign guests at Radlett when the exhibition opens next Tuesday will afford convincing proof that British designers and manufacturers can compete in quality with any in the world.

Bearing in mind the great difficulties under which

manufacture has been and still is labouring, it is no mean tribute to our aircraft industry that it should have been able to collect together the products of nearly 200 firms, these products ranging from the largest aircraft down to the smallest rivet.

In the aircraft field it can be said that every type will be represented, with the one exception of the very small private-owner class, in the production of which we have admittedly fallen behind, due almost entirely to the fact that the Government has not been able to make up its mind about the regulations which are to be applied to the flying of private aircraft.

So far as power plants are concerned, the visitors will see several advanced designs, not only of the plain jet class but of gas turbines driving airscrews. In the latter there is still much development work to be done, admittedly, but the examples shown will illustrate the general trend and serve as indications of the stage already reached.

The static exhibition at Radlett will illustrate the almost incredible variety of equipment now being produced by British firms, of which 157 are represented. The products show, better than anything else could do, the extremely high standards of workmanship demanded —and achieved—in all aviation material. A very full illustrated review of aircraft, engines and equipment will be published in next week's issue.

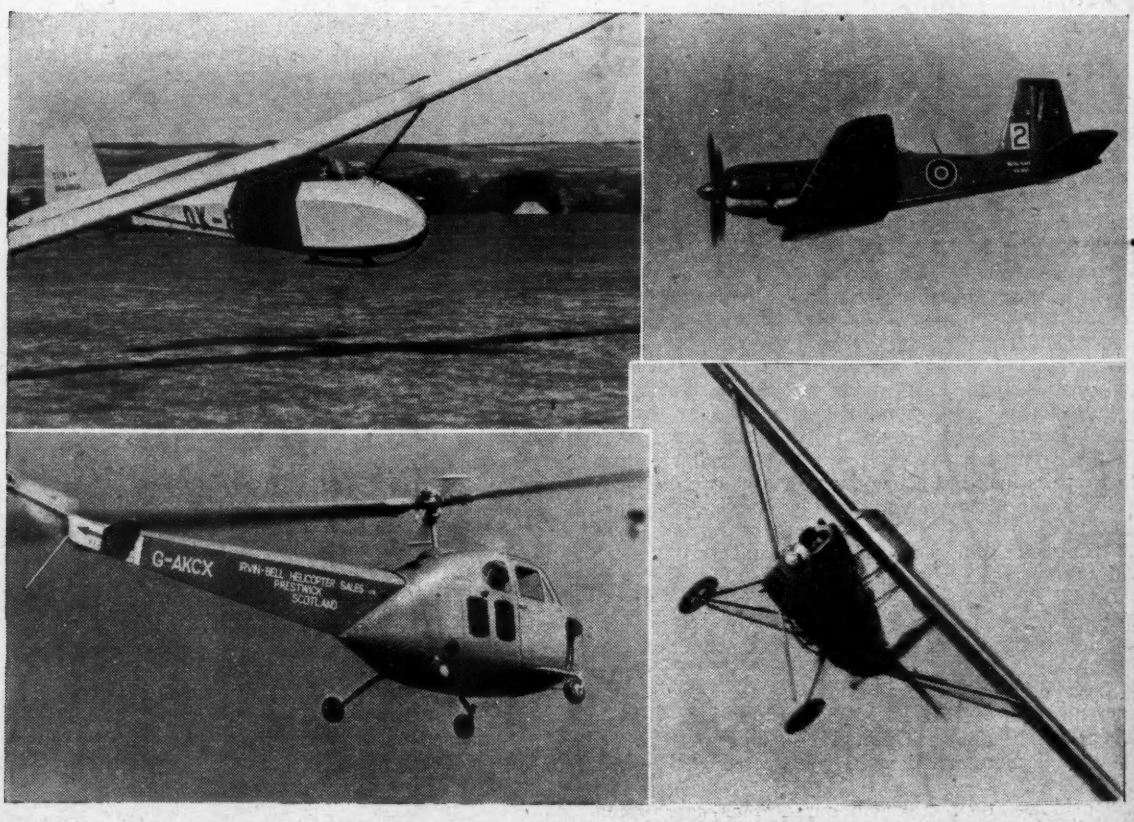
That the S.B.A.C. exhibition will convince the 6,000 invited visitors of British designing ability there can be no manner of doubt. Orders will largely depend upon the thorny question of deliveries, and these, in turn, can only be guaranteed if the various Government departments do their share by ensuring that fuel and the materials needed are available at the right time and in sufficient quantities. If that is done, the manufacturing firms will do the rest, and British exports will benefit.

The fact that the S.B.A.C. Exhibition is held again this year at Radlett has resulted once more in debarring the general public from the show. This, we feel, is regrettable. It may be argued that in any case the public does not buy aircraft or engines, nor even accessories, and that the show is very much in the nature of an export drive. But even admitting that fact, the taxpayer has some claim to consideration. Next year he must be given an opportunity to see the show.

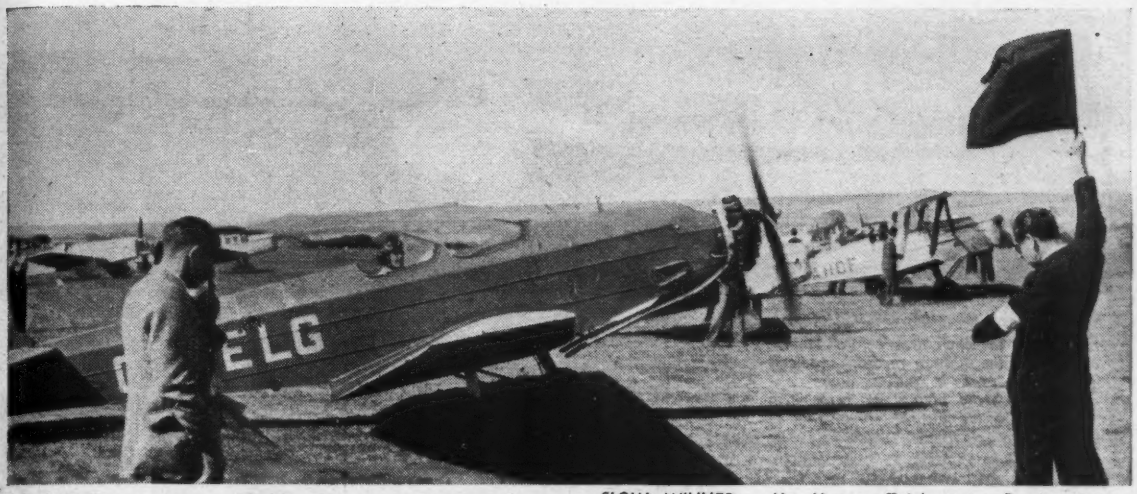
CONTENTS

Outlook	237
The Racing at Lympne	239
Here and There	242
Radlett 1947	244
The Anglo-American Conference	246
Miles Marathon	a
British Power Units	250
The Miles M.68	252
Newest R.A.F. Transport	253
Naiad Announced	254
The Feel of a Ghost	256
American Newsletter	257
Satellite on the Way	258
Civil Aviation News	259
Correspondence	262
Service Aviation	263

Forthcoming Events, page 245



LYMPNE MISCELLANY: (Top left) Marmol's Zlin sailplane on which he put up a wonderful show. (Top right) G/C. Flood flying his Firebrand into 2nd place in the High-speed Race. (Bottom left) "Jimmy" Youell demonstrating the Bell-Irving B-47 helicopter. (Bottom right) Harald Penrose shows off his 19-year old Westland Widgeon—complete with hooter.



SLOW WINNER: Mr. Mayne, official starter, flagging away Godfrey in the B.A. Swallow to win the Folkestone Trophy, shown below being presented to him by Mr. Lindgren. The silver bowl is the Siddeley Trophy, and the lady is organizer Ann Attrey.

The Racing at Lympne

Tenth Race for Folkestone Aero Trophy and Second High-speed Handicap : Records Broken

Illustrated by "Flight" photographs

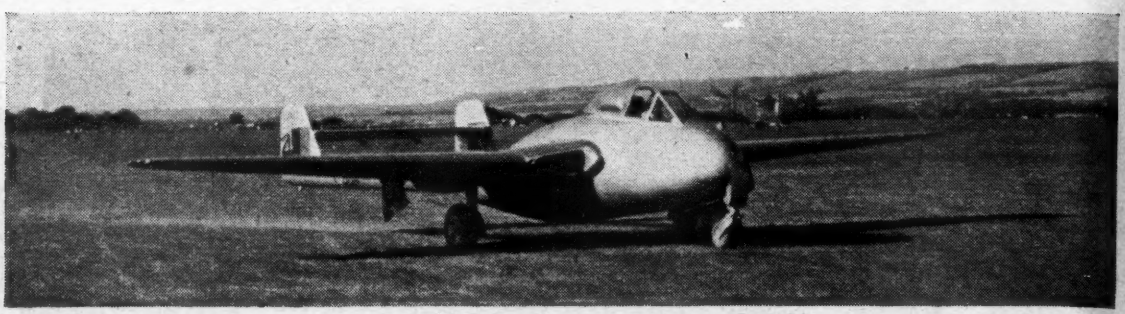
IN brilliant sunshine a lightly clad dark-glassed throng gathered at Lympne on Sunday, the last day in August, for the 1947 International Air Races. The afternoon's programme of events was opened by George Clarke who aerobated a Cinque Ports Tiger Moth to some tune. Considering the rather gusty conditions, it was a polished performance, thrown the more into relief by the small-beer mimic show put on at the same time by someone in an Auster. In particular, Clarke's falling leaf was nicely done; and as he slipped off height and came in to a fishtail landing, Mr. L. C. Marmol in the Zlin 24 "Krajanek" sailplane was towed off by an Auster. A nice point of the afternoon's sport was the arrangement whereby one event started just as the preceding feature finished; an unusual but welcome change in flying meetings. Whilst the Auster hauled the "Crackerjack" upstairs Harald Penrose crazily flew the 18-year-old Widgeon *avec* bulb horn, his performance being, as we have grown to expect, quite inimitable. Incidentally, Penrose ran out of essence when eight miles from Lympne owing to the headwind on his trip up from Yeovil. He landed, refuelled at a local garage, and continued his interrupted journey.

FAST WINNER: Peter Twiss looks happy on being congratulated by Dick Fairey on winning the High-speed Race at 305.93 m.p.h.

The Bell B47 helicopter was brought down from Prestwick by "Jimmy" Youell, who is now chief pilot of the newly formed Irvin-Bell Helicopter Sales Company, and an attractive little machine it appears to be. Marmol next did his demonstration of sailplane aerobatics: starting at about 3,000ft he looped, rolled, rolled off the top, flew inverted and then bunted, finishing up with a few stall turns and a beautifully judged final approach and landing in front of the members' enclosure. He well deserved the unstinted applause he received.

Racing Results

The first four in each of the three heats for the Folkestone Trophy race, which were run off the previous day, qualified for the final to be flown three times over the 19½-mile



WORLD BEATER: John Cunningham taxies past the enclosures before taking-off to beat the 100 km record. (Below) The large crowd in the members' enclosure watch the high speed turns over the airfield.

The Racing at Lympne....

closed circuit. At 3 o'clock promptly Paul Godfrey took off in the B.A. Swallow, and it seemed to be a hopeless task for the T.K.2, as it started on its first lap, to catch up with the Swallow, which by then was well round the second lap.

Porteous in the Chilton and Fillingham's T.K.2 flew on for a further lap in an attempt to beat existing class records for the 100 km closed circuit. Both aircraft were successful in this, the T.K.2 averaging 178.33 m.p.h. and the Chilton 123.72 m.p.h.

The winners of the Folkestone Aero Trophy were Paul Godfrey in the B.A. Swallow at 99 m.p.h., followed by Mr. Moseley in the Tipsy B, with the Chilton third.

In order to work up to the crescendo of the high-speed race, the Tiger Moth one-class scratch race followed next. This proved to be an interesting affair with much more atmosphere than the previous race. The Tigers went off in a mass start and flew over a ten-mile course for four laps, during which time they were not out of sight, although only when they crossed the airfield was it possible to distinguish the leaders.

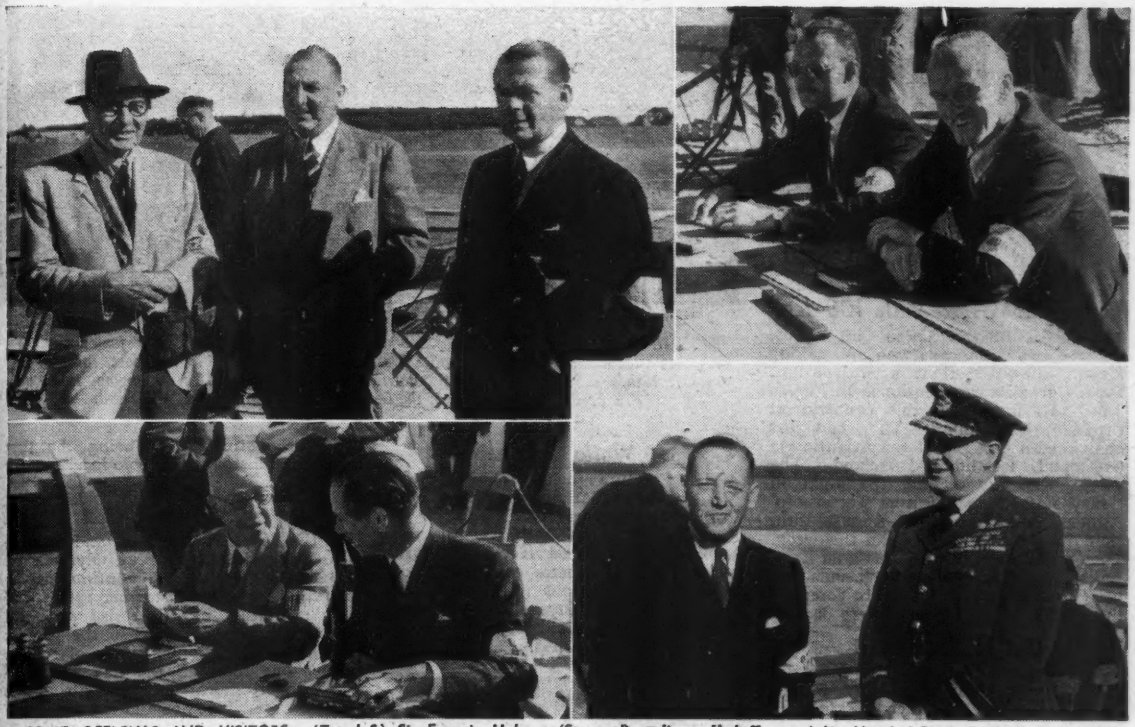
The winner was Mr. F. Kirk, who just managed to maintain a lead over W/C. Arthur.

The Start

The high spot of the afternoon was, of course, the Lympne High-speed Handicap Race. First away was Gordon Slade in the Fairey Firefly Trainer, with 6 min 51 sec start. He was followed, surprisingly soon after by Peter Twiss in the Firefly IV with 6 min 17 sec start. Again quite closely, Charles Flood took off with 5 min 54 sec start in the Firebrand, and the Spitfire VIII Trainer, flown by Guy Morgan, followed with a start of 5 min 9 sec. Bill Humble in his Fury then left, 3 min 28 sec ahead of the Vampire.

At the end of the first lap the order was unchanged and the Vampire took off just as Bill Humble made a wide but very smooth turn over the airfield on completing his first lap. On the second time round the different techniques were quite distinguishable, and Slade, still in the lead, was making tight turns close in and losing very little ground. Peter Twiss, on the other hand, was coming into the corner closely, but overshooting slightly, and Flood was taking them in a more gentle sweep. The Spitfire Trainer, however, was flown up to the corner rather wide and was then whipped into a steeply banked turn to cut off the corner. On this second lap Morgan's Spitfire was taking the home turn as the Vampire came round the corner at Hythe, and John Cunningham held the steeply banked turn in a wide sweep over the airfield to complete the first lap. Bill Humble then followed, and his technique was rather similar to Cunningham's, but, of course, not nearly so wide though equally gentle. In an incredibly short time the Vampire was round again on its second lap, having passed

AIRCRAFT PARK: The machines for the High-speed Race were parked in the front line for all to see.



SOME OFFICIALS AND VISITORS: (Top left) Sir Francis McLean (Steward), "Jimmy" Jeffes and Air Marshal Sir Roderic Carr (Judge). (Top right) W/C. Truman and Mr. F. Rowarth (Handicappers). (Bottom left) George Reynolds and Mr. P. B. Mayne (Timekeepers). (Bottom right) Capt. Hubert S. Broad and A.V-M. J. N. Boothman.

the entire field since it had been last seen at Lympne.

The next time the three leading aircraft appeared they were closer together, with the Firefly IV slightly in the lead as they approached the airfield. Slade, however, cornered very quickly and pipped Peter Twiss actually in the turn.

As we saw the Vampire take the corner by the gasometer at the end of the first leg of the last lap, the leading three aircraft were approaching the end of the second leg. They were all very low and disappeared from view until, over the trees, Peter Twiss brought in the Firefly IV to win by only just a few hundred yards from Charles Flood in the Firebrand. Gordon Slade was third in the Firefly Trainer, and the rest of the field came in in the order in which they started, but very closely upon each other's heels. Twiss had won the race at 305.93 m.p.h.

There were several interesting points which are worth mentioning, prominent among them being that Bill Humble this time averaged 358.14 m.p.h., whereas last year he won the race at 342 m.p.h. The Vampire's speed in the actual race for the four circuits was 494.63 m.p.h. Last year Geoffrey de Havilland averaged for the race 427 m.p.h. None of the pilots wore g-suits, and it is interesting that the average maximum acceleration for all the high-speed types in the race was 4½ g. whereas Geoffrey de Havilland last year experienced 6¼ g. Cunningham's Vampire employed aneroid fuel control so that he could have his throttle setting constant and not worry about height variation.

RECORDS MADE AT THE MEETING
(Subject to official confirmation)

100 km Closed Circuit			
•Unrestricted Class	D.H. Vampire ..	J. Cunningham ..	496.88 m.p.h.
2 litres and under ..	Chilton	R. L. Porteus ..	123.72 m.p.h.
2 litres—4 litres ..	Chilton	R. L. Porteus ..	123.72 m.p.h.
4 litres—6.5 litres	T.K.2	P. Fillingham ..	278.33 m.p.h.

* International record.

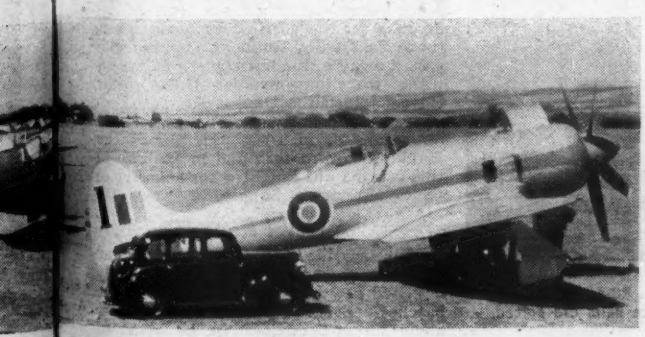
Following the high velocity struggle, a display of aerobatics was given by S/L. J. D. Derry who, like W. J. G. Morgan who flew in the race, is one of the Supermarine test team. Derry's handling of the Spit Trainer was a delight to watch. He gave a display of high-precision control such as one sees but very rarely, and although to pick out specific manœuvres from a feast like this is invidious, his hesitation rolls were a sheer joy. We wonder, too, did Geoffrey de Havilland start the spectacular fashion of half-rolling in a zoom and holding a steep inverted climb. It is a nice manœuvre.

Bill Humble followed the yellow Spitfire in his red and silver Fury and, of course, was considerably faster. His rocket loops were a prime feature, and one of the impressive aspects of the show was the quietness of the Fury; again, one sees the aircraft approaching very quickly, it flashes past, and the apparently low r.p.m. of its Centaurus is almost bathetic.

Peter Twiss once more took off in the Firefly IV and showed us all that he can fly with a goodly measure of precision, this being illustrated particularly in his demonstration of a trick we have never seen done before: he went through three-quarters of a slow roll to starboard and progressed into a vertical turn to port without, apparently, losing height in the very difficult transition.

For some reason John Cunningham left his trousers behind in the servicing van (so it is said) when he took the Vamp off for his turn of aerobatics, flying only in his shirt and overalls. Trousers or not, his show was as impressive as ever. It was noticeable that, during the vertical climb of his rocket loops, he drifted quite a bit in the beam wind, even the great speed of his climb being insufficient to disguise what, in a slower aircraft, would have been marked.

Altogether it was a satisfying meeting.



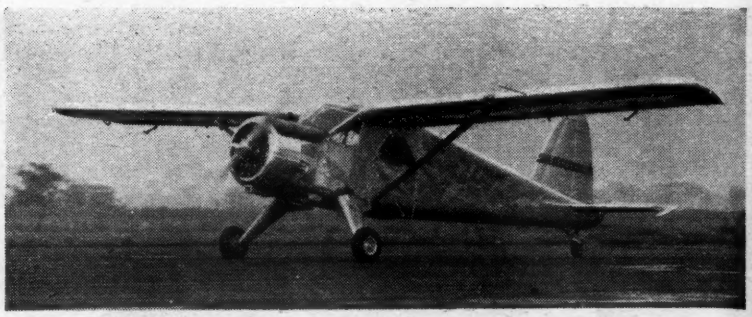
HERE AND THERE

Round the World with 100 h.p.

GEORGE TRUMAN and Cliff Evans, the two Americans who are making a round-the-world flight in two 100 h.p. Piper Cub aircraft (mentioned in *Flight*, June 12), landed in this country, at Croydon, last Friday. They had just completed a crossing of the Atlantic via Greenland, Iceland and Ireland. The pilots, who are making the flight in "easy stages," set of from Teeterboro' Airfield, New Jersey, on August 10th, were due to leave for Holland this week. They will fly via Paris, the Middle East, India, Japan, the Aleutian Islands and back to America, and hope to complete the journey in approximately 45 days.

Ultra-light Project

THE Aerotec Research Group, an unpaid, non-commercial body, formed last October to "further the field of flight," has announced ambitious plans for the construction of a single-seat, high performance ultra-light aircraft which will cruise at 100 m.p.h. and carry its pilot 300 miles at a cost of about eighteen shillings. It is hoped that the machine, which is to be named the "Sportsman," will become available in the form of a kit of parts, so that enthusiasts will be able, under controlled inspection, to manufacture their own aircraft at home. Design features will include a tricycle undercarriage, closed cockpit and two-way short-range radio, and the specification calls for a low landing speed of 30 m.p.h. The secretary of the enterprising group engaged in this project is Mr. David R. Macfarlane, 38, Conygre Road, Filton, Bristol.



PRODUCT OF CANADA: The D.H.2 Beaver (Pratt and Whitney Wasp Junior engine) receives a last-minute check prior to its first flight at the De Havilland airport, Toronto, on August 19th. A further version, fitted with a Gipsy Queen series 50 engine, is to be produced. A description of the Beaver appeared in "Flight," July 3rd.

World Record

OUR picture below shows Major Marion E. Carl, of the U.S. Marine Corps, who piloted the Douglas D-558 Skystreak on August 25th, when it broke its own world speed record by flying over a three kilometre course at 650.6 m.p.h. The previous record had been set up only five days earlier by Commander Turner F. Caldwell, who flew the Skystreak at 640.7 m.p.h.

Maj. Marion E. Carl.

Helicopter Queen

AN American woman, Miss Priscilla Handy, who during the war spent many hours in the air checking helicopter instrument readings, has now earned herself the distinction of being the first woman in history to fly solo in a Sikorsky helicopter.

Inspection Invited

THE 1947 Engineering and Marine Exhibition opened at Olympia on August 28th, and will continue to be shown there until September 13th. The last exhibition in this series was held before the war in 1937, so the present one provides an opportunity of seeing, under one roof, all the important engineering technical developments of the past decade. The demand for exhibition space was so great that the National Hall adjoining Olympia has also been engaged, providing an additional 90,000 square feet of floor space.

Appointment

AT a meeting of the General Committee of the British Association held at Dundee last week, Sir Henry Tizard was elected to be President of next year's meeting of the British Association, which will be held at Brighton. Sir Henry Tizard is chairman of the Defence Research Policy Committee and of the Government's Advisory Council on Scientific Policy. He was for many years chairman of the Aeronautical Research Committee.

Last Skymaster

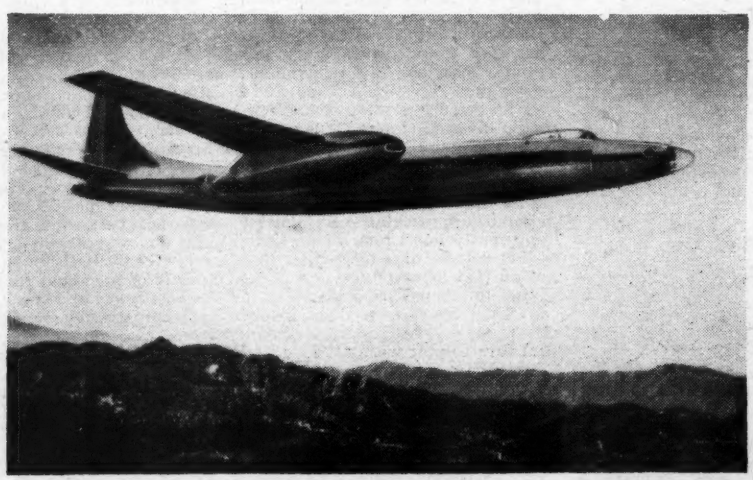
THE Douglas Aircraft Company has delivered its last D.C.4, number 1,242. This delivery marks the conclusion of a five-year manufacturing programme. Douglas report that D.C.4s now outnumber all other four-engined transports by about 7 to 1.

Sir Harold Kenward

HIS many friends in the aircraft industry will be sorry to learn of the death of Sir Harold Kenward, sales director of the Dunlop Rubber Company, who passed away in the liner *Queen Elizabeth* while travelling to the U.S.A. Sir Harold joined the Dunlop Rubber Company at the age of 17 and became London manager in 1924. He joined the Dunlop board in 1943 and in January of this year he was knighted for his services to the Ministry of Supply.

A Novel Hangar

NOW nearing completion at Schiphol Airport, Amsterdam, is a specially designed new hangar which has "service hatches" fitted at mainplane height to allow aircraft engines to be removed



FORTY-TON JET: A recent air-to-air view of the Consolidated-Vultee XB-46 jet bomber which weighs 91,000 lb and measures 113ft in span. The four jet units are paired, as in the Avro Tudor VIII.

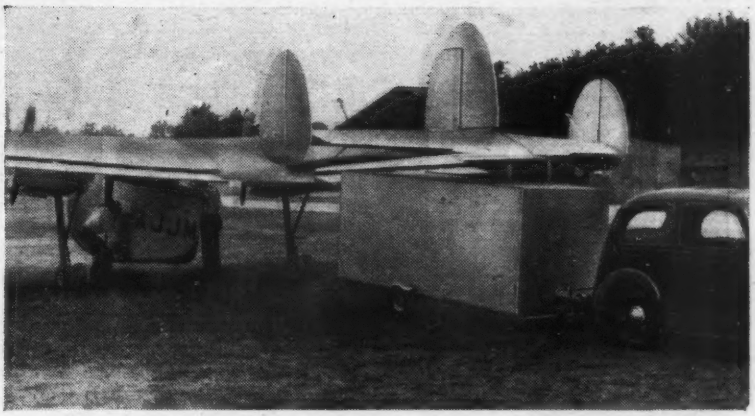
HERE AND THERE

through the walls for overhaul. At the front of the hangar, which is 84ft long 30ft wide and 30ft high, there are eight tall doors of tubular steel construction covered with canvas. In the side walls are large apertures at wing height, designed so that large aircraft can be accommodated. Small sliding ports incorporated in the construction of the rear wall allow an engine, which has been disconnected, to be taken through the hatch by means of a Clark lifting truck.

King Neptune Airborne

PASSENGERS flying from Entebbe to N'Dola recently in a Viking owned by Airwork, Limited, were provided with a novel diversion while "crossing the line." King Neptune (alias a supernumerary member of the crew) appeared magnificently garbed, complete with gilt-paper crown and cotton-wool beard, and carried out the usual rites associated with this ceremony. The men were shaved with a cardboard razor and the women powdered, and the six children aboard similarly dealt with, much to their delight. The 23 passengers were then duly issued with a certificate signed "Neptune Rex" absolving them from further "treatment" from the submarine world.

HEADROOM: Col. Douglas, C.B.E., A.F.C., chairman of de Havilland's South African company, who is 6ft 3in in height, finds he can stand comfortably under the centre section when inspecting the prototype Airspeed Ambassador.



BREAK-AWAY: The detachable air trailer portion of the ingenious new Miles M68, a description of which appears on page 252, is towed away from the airfield. The trailer carries its own road wheels and tow-bar.

Model Jet

AN unofficial speed record for model aircraft was set up at a St. Albans model aero club rally last week, when a jet-propelled model belonging to Mr. M. Guest, of Bushey Park Model Flying Club, attained a speed of 98 m.p.h.

Digging In?

A REPORT that the U.S. Army is supervising the digging of huge caverns under the mountains of New Mexico, as a defensive measure against a possible third World War, appeared in an American paper, the *Denver Post*, last week and caused some consternation on the other side of the Atlantic. The U.S. War department, however, refused to comment on the report.

S.L.A.E.

A BRANCH of the Society of Licensed Engineers, under the chairmanship of Mr. A. W. V. Laxton, has been formed at Bovingdon Airport. The hon. secretary is Mr. P. J. Stabbins and the assistant secretary Mr. R. N. Dallin. The branch already has 43 associate members and 10 student members, and lectures and visits to various aircraft manufacturers have been arranged. Those interested in joining should communicate with the hon. secretary.

Functional Furniture

A MILES Aerovan belonging to East Anglian Flying Services, Ltd., took off from Southend recently en route for Jersey. Aboard the aircraft were eight suites of furniture. The suites consisted of sectional furniture which is specially constructed by Lee Bridge Industries, Ltd., to enable it to be packed into confined spaces. In fact, because of its unique constructional design, a complete suite stacks into the space normally occupied by an easy chair. The appropriate trade name given this sectional furniture is "Airborne."

Sub-zero Tests

AT the invitation of the Ministry of Supply, a representative of the Dunlop Aviation Division recently visited the Winter Experimental Establishment at Edmonton, Alberta, Canada, where equipment tests were carried out by the Ministry and the R.C.A.F. Aircraft tyres, wheels, brakes and gun-firing equipment, designed and developed at the Dunlop rim and wheel works at Foleshill, Coventry, were also tested and proved satisfactory under Arctic conditions at Fort Nelson and Fort Churchill. A visit was also paid to Snag airport in the Yukon, where temperatures as low as 114 degrees of frost have been recorded.

News in Brief

It has been reported in the daily Press that a flying bicycle is to be shown at the exhibition of inventions, the "Concourse Lepine," opening at the Parc des Expositions in Paris on September 13th.

* * *

Statistics published by B.E.A. reveal that 69,602 passengers travelled on B.E.A. aircraft during the month of July. This figure shows an increase of 25.3 per cent over the June total.

* * *

Six aircraft, four Consuls, an Anson and a D.H. Flamingo belonging to British Air Transport, Ltd., last week flew 46 people, among whom were 31 Danes, to the Southport Flower Show. The trip was organized by the Lea Valley Growers' Association.

It is reported that the Netherlands Government is seeking the use of the R.A.F. Airport 14 miles north of Singapore for the use of the K.L.M. Amsterdam-Batavia service.

* * *

An extraordinary General Meeting of the Air League of the British Empire will be held at Kinnaird House, 1, Pall Mall East, S.W.1, on Thursday, September 25th, at 2.30 p.m.

* * *

Howard Clayton-Wright, Ltd., announce that they have now transferred the whole of their organization and their associate companies, Harrisflex Bearings, Ltd., and Clayflex, Ltd., to new premises at Wellsbourne House, Wellsbourne, Warwickshire. The new telephone numbers of the companies are, Wellsbourne 316/7/8.

Forecast and Programme for the Annual Flying Display and Exhibition Organized by the Society of British Aircraft Constructors

OF the many flying displays and exhibitions of aircraft and components which take place annually all over the world, there is none which compares in scope and technical interest with that of the Society of British Aircraft Constructors. This year the site is again to be the Handley Page Aerodrome near Radlett. Memories of last year's Display at Radlett will be revived by the heading photograph.

Before the war the Royal Air Force Display was held annually at Hendon on the last Saturday of June and it was attended by many foreign visitors. The first S.B.A.C. Display was organized in 1932 as a special function for the benefit of these visitors and held at Hendon on the Monday following the R.A.F. Display. By comparison with post-war S.B.A.C. displays this first one was very small, about 40 aircraft being shown. Not until the fourth Display in 1935 was a static exhibition organized, and on this occasion some 65 manufacturers took stands.

Growing Importance

The following year, due to the great increase in support and the resulting need for more space, the de Havilland airfield at Hatfield was made available, and in 1937 for the first time a two-day show was arranged with flying display on the second day. As a result of the international situation no more displays or exhibitions were organized until after the war in 1946, and the R.A.F. Display has now been abandoned altogether. This year nearly 200 firms will exhibit their products at the four-day function at Radlett.

The past year has seen a great deal of progress in both civil and military aircraft construction and in the piston and gas turbine engines to power such aircraft. Visitors to the Radlett Exhibition on Sept. 9-12, will be able to examine several new civil transports such as the Airspeed Ambassador, Cunliffe-Owen Concordia, Miles Merchantman and M68, and Percival Merganser. In addition

RADLETT WEEK PROGRAMME

Tuesday, Sept. 9th.—Exhibition, 10 a.m. to 5.30 p.m.; Official Opening and Luncheon; Flying Display, 2.30 p.m. to 5.20 p.m.

Royal Aeronautical Society (Anglo-American Conference) Dinner at the Guildhall, London, 7 p.m. for 7.30 p.m.

Wednesday, Sept. 10th.—Exhibition, 10 a.m. to 5.30 p.m.; Flying Displays as for Sept. 9th.

Thursday, Sept. 11th.—Exhibition, 10 a.m. to 5.30 p.m.; Flying Display, morning gliders, afternoon civil aircraft.

Friday, Sept. 12th.—Exhibition, 10 a.m. to 5.30 p.m. for technicians from Government and Industry only. No flying display.

Saturday, Sept. 13th.—Exhibition closed.

Sunday, Sept. 14th.—Royal Aeronautical Society Garden Party, at Radlett 2.30 p.m. to 7 p.m. Static exhibition and flying display, including gliders.

Transport to and from Radlett

By Air.—Radlett airfield is closed to all aircraft except those taking part in the display. Visiting aircraft may land at Elstree airfield.

By Rail.—From London (St. Pancras) to Radlett.

By Motor Coach.—From Victoria Coach Station at 19 and 49 minutes past every hour. Journey one hour. From Radlett (Red Lion) at 18 and 43 minutes past the hour.

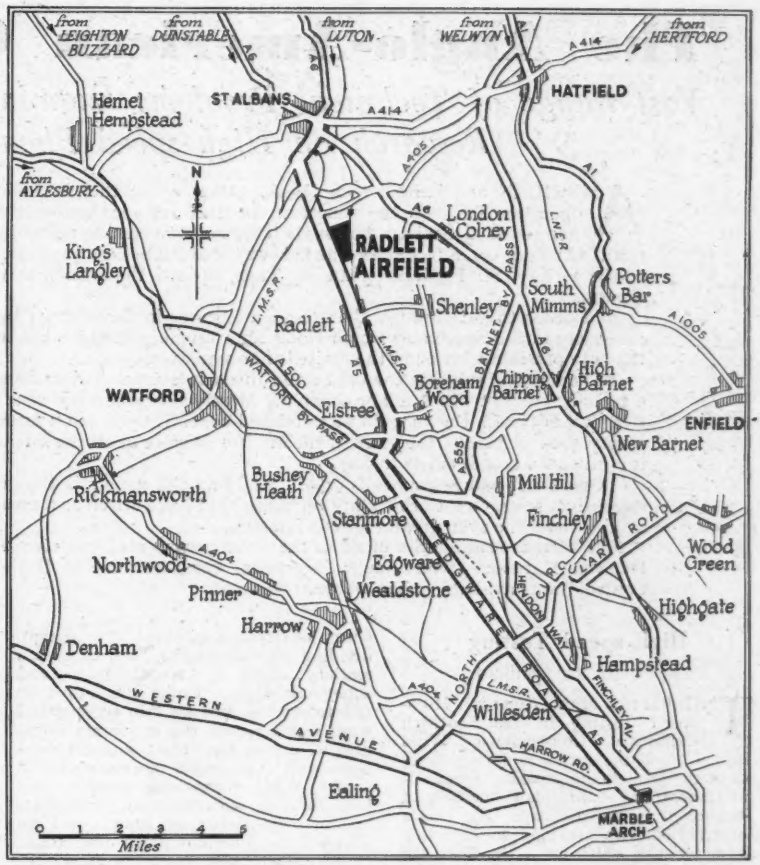
they will see new and improved Service aircraft such as the Westland Wyvern, Blackburn Firecrest, Saunders-Roe A.I., Vickers Valetta and Heston A.O.P., as well as new elementary and advanced trainers.

Outstanding among the year's new power units are the Napier Naiad airscrew turbine, described elsewhere in this issue, and the Rolls-Royce Eagle piston engine which will be seen in the Wyvern.

Makers of aircraft components, special equipment and accessories may not be able to display their products in such a spectacular manner as the aircraft constructors but they will nevertheless be present in force in the static section of the exhibition, and there is no doubt that advances in this most important branch of the aircraft industry have been, if anything, of greater importance and promise than many of the aircraft themselves.

Special Equipment

Many types and sizes of airscrew will be seen and the majority of them demonstrated. Examples of new special equipment worthy of particular attention are the Smiths electric autopilot operating on the rate as opposed to the displacement principle; the G.E.C. small two-way radio for light aircraft and the same company's hot-air oven for the galleys of larger aircraft; the Decca Navigator Company's new airborne receiver and lane identification unit (the last named will be demonstrated); and Marconi's automatic radio compass. Almost innumerable examples of other equipment, from the Martin-Baker ejector seat to the Tharra buried rivet could be mentioned.

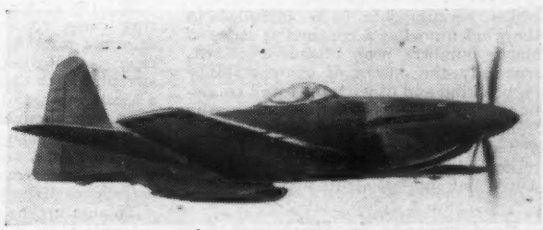


A "Flight" Copyright map showing the main approaches to Radlett airfield.

MORE ABOUT THE M-B V

ONE of the finest all-round single-seat piston-engined fighters ever produced in this, or any other, country is the Martin-Baker M-B V, to Air Ministry specification F.18/39. This exceptionally clean low-wing monoplane, powered by a Rolls-Royce Griffon 83 engine driving a six-blade contra-rotating airscrew, was described and illustrated in *Flight* of November 29th, 1945, since which time full particulars of performance and of certain constructional features have become available.

The maximum level speed of the M-B V is 460 m.p.h. at 20,000ft; even at as low an altitude as 6,000ft the speed is 425 m.p.h. With normal fuel (200 gallons) the range is 1,100 miles. Other data are: time to 20,000ft, 6.5 min.; time to 34,000ft., 15 min.; service ceiling, 40,000ft; take-off distance (over 50ft, calm), 420 yards; landing distance (over 50ft, calm), 550 yards. Readers who were fortunate enough to see S/L. Zurakowski's demonstration at Farnborough during 1946 will feel certain that the stalling speed, with flaps and undercarriage down, is no more than the 95 m.p.h. claimed.



The clean aerodynamic design of the M-B V is reflected in its speed of 460 m.p.h.

Some illuminating extracts from the Engineering and Maintenance Appraisal drawn up by the Aircraft and Armament Experimental Establishment at Boscombe Down in March last year may now be quoted. It is considered, states the report, that the general design and layout of the M-B V is excellent and is infinitely better—from the engineering and maintenance aspect—than any other similar type of aircraft. It is further considered that the layout of the cockpit might very well be made a standard for normal piston-engined fighters, and that the engine installation might be applied advantageously to other aircraft.

FORTHCOMING EVENTS

Aug. 28th to Sept. 13th.—Engineering and Marine exhibition. Olympia, London.
Sept. 3rd to 6th.—Royal Aeronautical Society: Aeronautical Congress.
Sept. 6th.—Naval Aviation: Air display and static exhibition. Lossiemouth air station, Moray, Scotland.
Sept. 6th.—Air display at R.N.A.S. Yeovilton.
Sept. 9th.—Royal Aeronautical Society: Dinner at the Guildhall, London.
Sept. 9th to 12th.—S.B.A.C. Exhibition and Display.
Sept. 13th to 15th.—Cannes Aero Club "Ailes d'Azur" Film Festival air rally. Cannes-Mandelieu airfield.
Sept. 14th.—Royal Aeronautical Society: Garden party, Radlett airfield.
Sept. 17th to 19th.—Federation Aeronautique Internationale: Annual General Conference, Geneva.

The Anglo-American Conference

Vast Range of Technical Problems Examined : The Need for Research on High-speed Phenomena

AMERICAN and British technicians, gathered together in London as a result of joint co-operation between the American Institute of the Aeronautical Sciences and the Royal Aeronautical Society, began their three-days' session yesterday, when seven papers were read. On Tuesday, a reception was held at the R.Ae.S. headquarters, and yesterday the president of the society, Sir Frederick Handley Page, opened the session in the South Hall, Bloomsbury Square.

In order to get through the nineteen lectures in three days, two are being delivered simultaneously in the South and North Halls, an arrangement which has its drawbacks, but which was the only possible solution in the limited time available.

The range of subjects treated by the different lecturers covers a vast field, and there is scarcely a technical aspect which is not covered. Mostly the papers are of a highly technical nature, and to do them justice they should be published collectively in book form. Together they would give a very good picture of the state of the art (for in spite of all the science applied to aircraft design, it is still an art) as it exists to-day.

One thing which impresses one in studying the papers is the great need for extensive (and expensive) research into the many problems that have arisen as a result of the great speeds already attained and the even greater speeds foreseen.

Following are summaries of six of the seven papers read yesterday. Unfortunately no copy of Dr. von Karman's paper on "Theoretical Consideration of High-speed Flight Stability and Control" was available when we went to press.

High-speed Testing

By Clark B. Millikan

THE full title of this paper is "High-speed Testing in the Southern California Co-operative Wind Tunnel" and the author is acting director of the Daniel Guggenheim Aeronautical Laboratory, Californian Institute of Technology. In the paper the major constructional features and aerodynamic characteristics which make the Southern California Co-operative Wind Tunnel particularly suitable for testing in the high subsonic speed range are described. Certain operating procedures and techniques have been developed because of their special usefulness for such tests, and these are discussed in some detail. A device called the Lockheed "Bump," which permits data to be obtained in the wind tunnel at a continuous series of Mach numbers near 1 are discussed, especially the effects of compressibility on blocking and other tunnel-wall corrections. Pertinent experimental results from a number of recent tests are presented, and preliminary results of theoretical blocking calculations for swept wings and support struts are given.

Performance in High-speed Flight

By W. G. A. Perring, Director R.A.E.

BEFORE dealing with the main subject of his paper, Mr. Perring outlined the experimental facilities available in this country, notably the high-speed tunnel at Farnborough. This has a working section of 10ft by 7ft, is powered by a 4,000 h.p. motor, and can be operated at pressures ranging from near vacuum to 4 atms. abs. The choking speed (the speed of sound in the working section) is reached when the stagnation pressure is 0.25 atmospheres.

The main body of Mr. Perring's paper was devoted to an outline of compressibility effects on lift, drag, pitching moments and trim, and controls.

Mr. Perring dealt next with the influence of compressibility on design, dividing his examination into two main sections: flight up to sonic speed, and supersonic flight. Under the former he referred to the need for thin symmetrical wing sections with the maximum thickness at 0.4 of the chord, and for fuselages with a minimum of cross-sectional area. When everything possible had been done in that direction, further delay of compressibility drag could be achieved by sweeping back the wings. Unfortunately this could not avoid the conditions on the centre line, nor delay compressibility influencing the drag of the fuselage. Unless the aircraft were large, a fuselage would have to be provided, and this not only caused drag in itself but might give rise to breakaway at the junction of wing and fuselage.

In view of these drawbacks, Mr. Perring came to the conclusion that for subsonic aircraft we were unlikely, except in all-wing types with extreme sweepback, to delay the drag rise beyond a Mach number of 0.9. Even on all-wing types he thought it likely to be uneconomic to push the speed much beyond the 0.9 figure, since to do so would involve extreme angles of sweepback and introduce difficult control problems.

To sum up, he thought the high-speed subsonic aircraft would have thin wings, a slender fuselage, and a 45 deg sweepback. It might be well to consider forms of spoilers for control in roll and pitch on all-wing aircraft, or perhaps better still, spoilers or all-moving wing tips for roll and the retention of a tail but with all-moving tailplane.

In considering flight at supersonic speeds, Mr. Perring outlined the importance of thin wings, dealt with the effect of plan form and aspect ratio, which have a large effect on drag at Mach numbers below about 1.6 to 2, but when the Mach number reaches 2.0 the plan form ceases to be important, and the drag coefficient is almost entirely dependent on the thickness-chord ratio.

Concerning body drag, Mr. Perring foresaw a shape of parabolic profile, with a length/diameter ratio of about 12. The drag coefficient of such a body would be about 0.20 and skin friction would still account for about 60 per cent of the total drag.

With probable figures for wing and body drag established, Mr. Perring examined the possibilities of supersonic flight. At Mach numbers of 2.0 and above, the drag coefficient of a wing of 0.07 thickness/chord ratio, based on frontal area and making an allowance for friction drag, was about 0.22. As mentioned above, the drag coefficient of the body would be of the same order. This drag, the lecturer said, was barely within the thrust capacity of a gas turbine, but should be within the capacity of the ram jet or rocket. Near the speed of sound, the drag coefficient of an unswept wing, even without any allowance for body drag, exceeded the thrust capacity of a gas turbine when the throughput was only 12lb of air per square foot of frontal area per second, a fairly conventional value for present-day axial turbines. It far exceeded the thrust of the practical ram jet but fell well within the capacity of the rocket.

Mr. Perring concluded his paper with the following summary: "In the near supersonic range one should look to the development of compact gas-turbine units with reheat and having small frontal area, while at speeds around Mach numbers of 2.0 and over, a combination of the rocket and ram jet—the rocket being provided to deal with the transonic region—would appear to be the best combination."

Icing Problems

By Abe Silvestein

THE author of this paper is one of the leading workers in the Flight Propulsion Research Laboratory of the American National Advisory Committee for Aeronautics. His paper deals with the work that has been done in investigating aircraft icing problems in the major aircraft research laboratories in the United States and Great Britain for the past fifteen years. The fundamental studies of Hardy and his co-workers at the Royal Aircraft Establish-

The Anglo-American Conference . . . . .

ment, and the experimental research of Rodert and the N.A.C.A. Ames Laboratory Group on heat de-icing, have established methods for aircraft ice prevention on a sound engineering footing. Requirements for maintaining ice-free surfaces on wings, airscrews, windshields, and carburettors are briefly discussed in the report, and the status of the icing problem for the turbine engine inlet is reviewed.

Whereas it is now possible to design with reasonable assurance of successful operation ice-prevention equipment for specified icing conditions, it is not possible to specify the icing conditions that may be encountered in all-weather operations over world-wide transport routes. Limited data obtained from recent flights in the United States relating to the water content and drop size in icing clouds are presented. Emphasis is placed on the necessity for the accumulation of statistical data in the characteristics of icing clouds, so that basic design conditions may be accurately specified.

Control in Low-speed Flight

By M. B. Morgan, R.A.E.

THE lecturer confined himself to stability and control problems of flight at moderate speeds, uncomplicated by Mach number and distortion effects. He began by showing how wing loadings have increased and power loadings have decreased between 1930 and the present time, the former from 14 to 70 lb/sq ft and the latter from 16 to 10 lb/h.p. Concurrently the "classical" take-off distance from rest to 50 ft has risen from 500 to 1,500 yards.

Safety after engine-cutting had increased this distance. In 1940 it was 1,500 yards, but since then it had risen to an average value of 2,700 yards. "We cannot go on in this way," Mr. Morgan said. "Closer attention to wing loading, to aerofoil and flap design, and to critical engine-failure speed is obviously indicated."

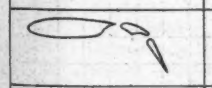
In connection with the engine-cut case, the lecturer pointed out that the average safety speed rose from 100 m.p.h. in 1939 to 135 m.p.h. in 1947. It would be higher but for the very large fins and rudders, which had in some cases brought the safety speed down to stalling speed. But on some multi-engined transports these large fins and rudders were not used to the full, since safety speed was determined not by rudder power but by the force the pilot could exert at climbing speed. Reduction in safety speed had been achieved by power-boosting of the rudder control.

Since increase in size slowed-up the response to control movement, it might have been feared that the very large aircraft now being built would call for drastic alteration in relative control areas. Recent response calculations, however, indicated that, surprisingly enough, none of the parameters which really matter to the pilot are so affected by sizes up to 500,000 lb as to make manœuvres difficult. These parameters were: height of start at hold-off; forward distance covered when shifting track sideways by S-turns; and time to raise a dropped wing.

Turning to the subjects of the stall, maximum lift coefficients and control at high lift, Mr. Morgan examined methods of increasing maximum lift coefficients. Unless wing loadings were stabilized it might become necessary to resort to devices more ambitious than those now in use. Some of these are shown in the accompanying diagram. A "peak" is reached with full-span double Fowler flap and full-span leading-edge slot, the value of maximum lift coefficient being then 4.56. There were many practical obstacles in the way before such a figure could be achieved, notably lateral control and longitudinal trim difficulties.

The lecturer foresaw little difficulty in providing adequate lateral control at a lift coefficient of 3.0 for heavily loaded aircraft. He favoured the backward-moving flap which, in the intermediate position, would also give improved take-off due to its high lift and low drag.

Longitudinal stability was the handling problem which gave designers the most trouble. The lecturer pleaded for designing aircraft with the c.g. well forward and placing the undercarriage accordingly. This was by far the most economical method of avoiding longitudinal stability trouble. It should be coupled with a tail somewhat larger than was really thought necessary. American designs showed tails some 25 per cent larger than British, while working to about the same c.g.-aft limits, but to a much farther forward c.g.-forward limit.

	FLAP TYPE	60% SPAN			100% SPAN		
		ΔC_L	$C_{L\,MAX}$	w_s	ΔC_L	$C_{L\,MAX}$	w_s
	NACA DOUBLE SLOTTED	1·11	2·61	42·7	1·61	3·11	50·9
	FOWLER	1·15	2·65	43·4	1·67	3·17	51·9
	BLACKBURN SLOTTED + SPLIT	1·32	2·82	46·2	1·91	3·41	55·8
	FOWLER + SPLIT	1·32	2·82	46·2	1·93	3·43	56·2
	DOUBLE FOWLER	1·54	3·04	49·8	2·25	3·75	61·4
	DOUBLE FOWLER + WING SLAT	2·35	3·85	63·0	3·06	4·56	74·7

Advanced schemes for achieving high lift coefficients. w_s=wing-loading in lb/sq ft to give stalling speed of 80 m.p.h. All flaps have a chord of 0.4 of the wing chord. Slat chord=0.3 wing chord. Ratio tail arm: wing chord =3. Aspect ratio=9. Taper ratio=2:1. C_L wing =1.5. Ratio wing thickness: wing chord=0.16.

Mr. Morgan next dealt with some of the difficulties encountered with tailless aircraft, particularly near the stall. Some of these might be overcome by what he termed "ersatz stability." Quite large yawing moments could be generated on an all-wing type of aircraft by applying drag at the wing tip—given by spoilers, double flaps, and so on. Sideslip could be measured by a wind-vane, rate of yaw by a spring-restrained gyro. It should be possible, he thought, to feed such measurements into a servo-mechanism, thus increasing sideslip and rate-of-yaw values until they equalled or even handsomely exceeded those appropriate to conventional aircraft. This was not new. During the war it was found that four-engined bombers could be flown more accurately if the aircraft were flown by the automatic pilot, the human pilot being given a small "stick" whereby he could manœuvre the aircraft via the automatic pilot.

Much further work was needed on the best method for bringing the pilot's control into play while the automatic pilot was working continuously. Development was proceeding along three lines:

(1) Using a common surface for the "ersatz" stability mechanism and the pilot, so that when the pilot moves his stick, he merely feeds signals into the automatic pilot.

(2) Splitting the control surface, coupling the pilot's stick directly to one half, the automatic pilot to the other.

(3) Keeping the pilot's stick directly coupled to the controls, as on conventional aircraft, and making the automatic pilot merely operate a tab on the control surface. Power-operation would provide consistently light stick forces. This might lead to the pilot overstraining the machine, and it was vital that work on the development of suitable "g-restrictors" should proceed in parallel with power-operation development.

Mr. Morgan concluded his paper with an examination of gust-alleviation devices and stalling at high altitudes.

Economics of Personal Aircraft

By Grover Loening

AMONG the American pioneers of aviation the name of Grover Loening stands high. He is now a member of the National Advisory Committee for Aeronautics. The first part of his paper deals with the production and use of privately-owned aircraft in America. In the banner year 1946 some 35,000 personal aircraft were delivered in the U.S. Production in other countries may have brought that figure up to 40,000 private aircraft—less than one week's production of American automobiles

Mr. Loening comes to the conclusion that the most serious obstacle to private flying, and one about which we must be particularly realistic, is that of cost. There is no denying the figures, nor is there any denying of the very evident fact—at least in the U.S.—that the high cost of operation, in relation to the results obtained, in the use of personal aircraft is to-day, by far, the most serious obstacle in this picture.

To attain a mass production market, the airplane must of course blend itself into the life of an individual the way the automobile did. An average American use of an automobile will be about 10,000

The Anglo-American Conference . . . . .

miles a year, and the average usage in hours would be about two hours a day or 600 to 700 hours a year. The maximum that a private owner can use his airplane in a year is 200 hours of flying.

To get any kind of a production market, costs must either be lowered or justified. We must extend greatly the number of hours per year that an airplane will prove useful to an owner.

Aircraft designers and manufacturers must change their philosophy, and realize that they are not in the business of selling an airplane as such to air enthusiasts—but are in the business of delivering a method of transportation, a service.

The extension of flying hours of a privately owned airplane from the 200 hours we have been considering for an owner, to the 2,000 hours a year that a plane should be used in order to justify its position in our economy, is made possible by two means to which we should give attention. Flying clubs and the "company" plane. Large corporations are purchasing aircraft for the use of their executives and engineers. While this is a professional and business use, it is a non-profit private ownership that has actually proved conspicuously successful in many instances, particularly with oil, mining, and country-wide merchandizing concerns. In these instances cost again becomes reasonable, merely because so much flying is done per year that the cost per hour comes way down.

The development of the so-called "roadable" airplane is an immediate prospect. Here the designers will try to provide the owner with his automobile, and also with wings to be attached. This is a most important trend but one that we cannot appraise fairly yet.

Consideration of the helicopter at once enters this picture, but not promisingly so at the moment.

Temperature Accountability

By K. T. Spencer and P. A. Hufton

"MODERN Operational Factors Affecting Airworthiness" was the title of the paper presented by K. T. Spencer, of the Ministry of Supply, and P. A. Hufton, of the Aircraft and Armament Experimental Establishment, Boscombe Down. But the authors decided to concentrate on one of the many problems: "temperature accountability." The authors defined this curious expression as "the taking into account, more accurately than is now done, of variations in an aircraft's performance arising from the fact that the atmosphere in which it flies will almost always be different from the theoretical standard atmosphere on which the performance estimates of aircraft are at present based."

The problem is most acute when assessing maximum safe take-off weight. Current practice is to schedule take-off performance for a range of airfield altitudes, assuming that the variation of atmospheric density, pressure and temperature with height conforms to the standard (I.C.A.N.) atmosphere. In an extreme case the real atmosphere may have very different characteristics.

Current international rules permit either of two methods to be used: the "geographical altitude method" or the "equivalent density altitude method." To show how the former could err, the following comparison was given:—

	Standard Atmosphere	Tropical Airfield Atmosphere
Density (slugs/cu. ft.)	0.002378	0.002154
Pressure (millibars) ...	1013.2	1013.2
Temperature (deg. C.)	15	45

The second method takes the standard atmosphere scheduled performance at 3,350ft and assumes that this will obtain at the tropical sea level airfield. But at that airfield the temperature is 45 deg C, whereas at 3,350ft in the standard atmosphere it is only 8.4 deg C. Tabulating:—

	Density (slugs/cu. ft.)	Pressure (millibars)	Temperature (deg. C.)
Real values at sea level tropical airfield	0.002154	1013.2	45
Standard atmosphere values at sea level ...	0.002378	1013.2	15
Standard atmosphere values at 3,350ft.	0.002154	896.6	8.4

The variation of engine power with atmospheric density, pressure and temperature is complicated. No one law covers even all conventional types of piston engine, and the turbo-jet introduces a still wider range of variations. To illustrate this fact, two types of aircraft were examined: type A, a twin-engined machine with piston engines operating below supercharge height, and B, a four-engined aircraft with turbo-jets. The calculated take-off distances to clear 50ft, with all engines running, were, for aircraft A: geographical altitude method 865 yards; real performance 985 yards. For aircraft B under the same conditions, the corresponding figures were 1,410 yards and 1,985 yards. The weight reduction needed, for aircraft A, to keep the one-engine-out angle of climb constant at 0.0260 in real atmosphere was 10.5 per cent.

After explaining the existing I.C.A.O. rules and their effects on operation, the authors outlined some of the difficulties in introducing "temperature accountability" into operating rules. They can be considered as made up of three parts. The first is the ascertainment of the aircraft's performance, not only under standard atmosphere conditions but also under a sufficient range of non-standard.

The second difficulty is to present the scheduled information in a way in which it can be easily grasped. For any standard or non-standard atmospheric conditions the pilot must be able to ascertain at once, without calculations, the pertinent performance characteristics.

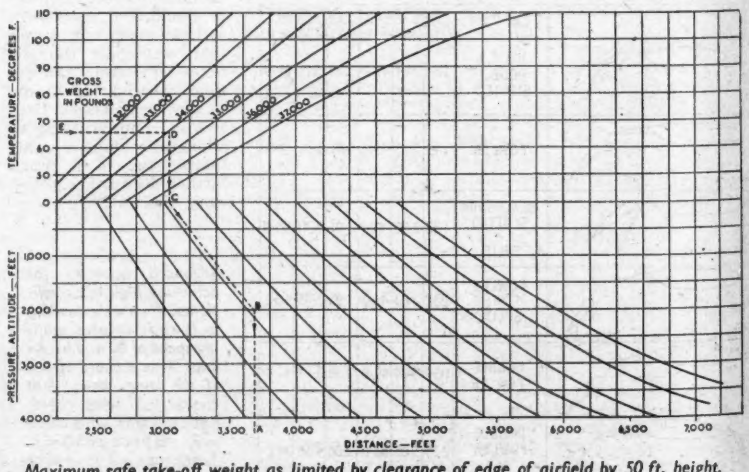
The third difficulty is to decide what values of density, pressure and temperature are to be taken.

The first difficulty is not serious, and the second difficulty—presenting the scheduled information so that it can be used easily by the operator—could be overcome. It means scheduling the variation of aircraft performance with temperature as well as with altitude, wind, weight, and so on. One way of doing this for the two parameters, temperature and altitude, is shown in the graph. This method has been developed by A. V. Roe, Canada, Ltd. The graph can be used to give the maximum safe take-off weight as limited by any one of the several I.C.A.O. operating rules. For any given airfield and time the pilot will know the temperature, pressure, and available runway length. Assuming the latter is represented by point A in the graph, a vertical line is drawn from A to B, B representing the pressure altitude of the airfield. BC is drawn parallel to the nearest of the family of curves and a vertical drawn from C to the point D level with the atmospheric temperature E. Then the curve on which D falls—in this case 34,000—gives the allowable take-off weight.

This leaves, then, only the third difficulty: what values of density, pressure and temperature should be used at any particular time and place?

The many possible answers to this all fall within two extremes. At one extreme is the scheduling for individual airfields of long-term average values of density, pressure and temperature.

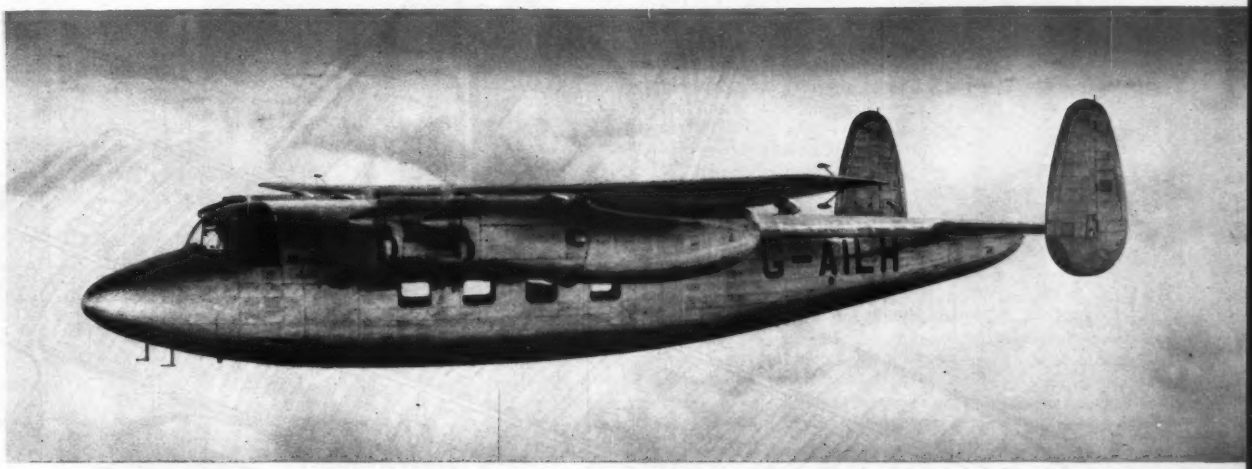
At the other extreme is the determination, immediately prior to the take-off, of the real values of the density, pressure and temperature. This, from the technical point of view, is the right thing.



Maximum safe take-off weight as limited by clearance of edge of airfield by 50 ft. height. (I.C.A.O. Ops. Standards, Section 4.4.3.)

Miles MARATHON

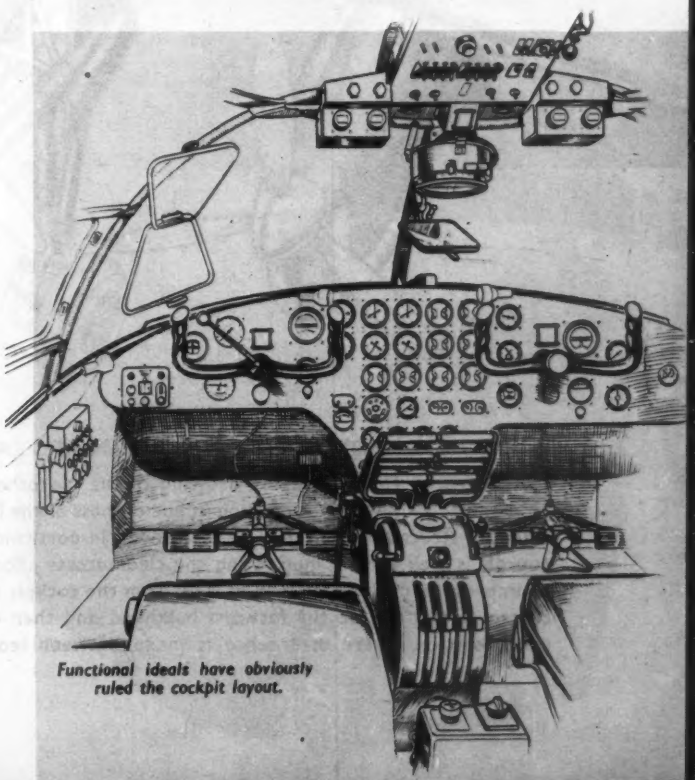
Objective Appraisal of the New Miles Four-Engined Feederliner: Excellent Performance: Generous Internal Capacity: Novel Features



THERE is an elegance and air of purpose about the Miles Marathon which is remarkably attractive—so much so that one comes to regard the capacity of the aircraft with something of surprise. It is astonishing that so slim and eager-seeming a fuselage should, in fact, be so capacious; yet even this realization does not—although it should—prepare one for the severely practical performance. One rather naturally expects rapidity from so clean-looking a shape, and the Marathon is certainly fast; but its payload/range figures and likely operating costs emphasize that here is an aircraft which, although cast in thoroughbred mould, has enough of the work-horse in its make-up to be an attractive proposition to operator, passengers and aircrew alike.

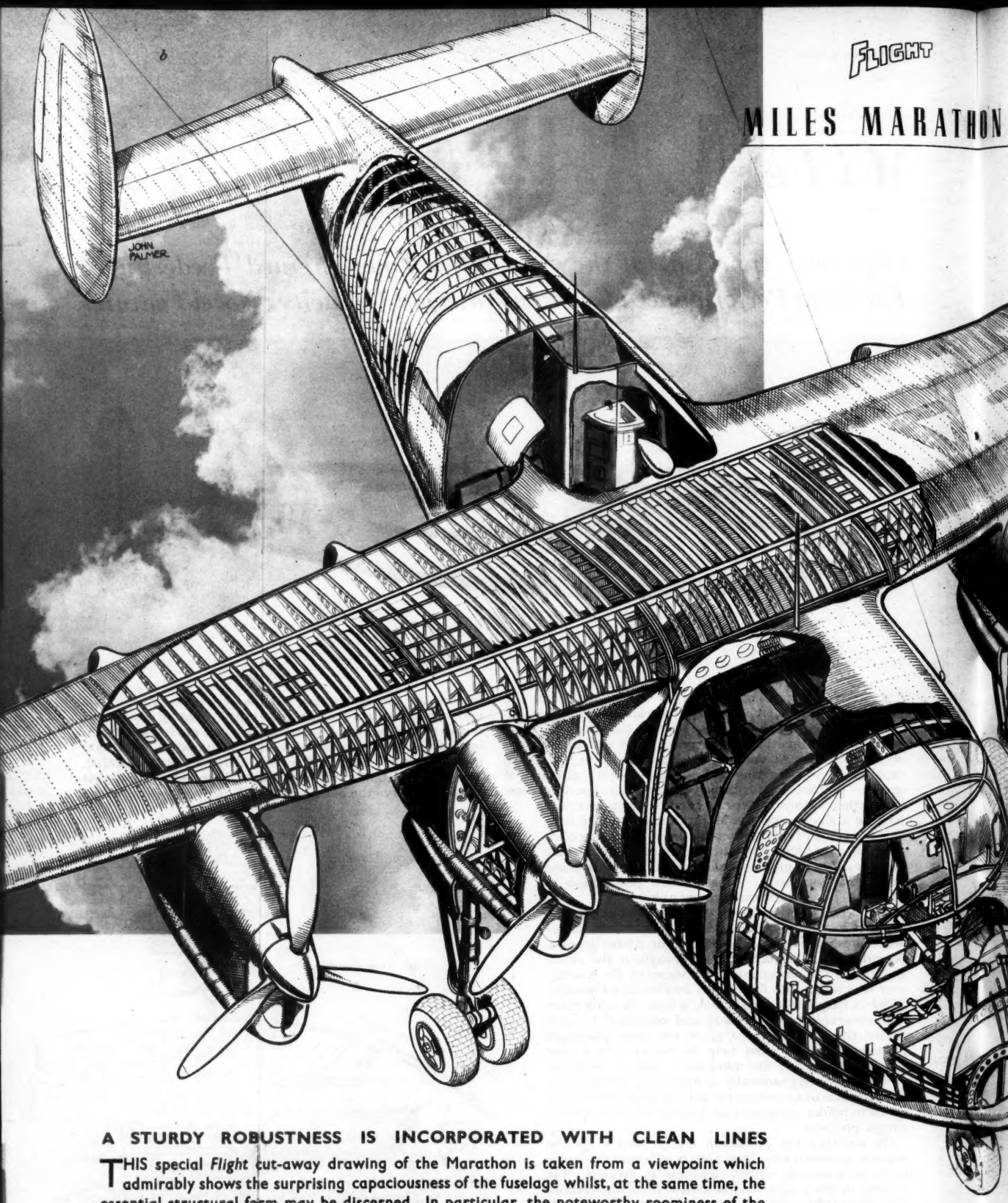
The present design trend, in the smaller categories, toward a high-wing layout gives the Marathon an entry-door threshold which is but 2 ft. 5 in. above ground, permits an unobstructed floor throughout the cabin, and allows the passengers clear views of the country over which they are flying. An incidental advantage, which is frequently unregarded, is that the wing offers a considerable area of shade and consequently precludes the discomfort of glare for most passenger positions; it also must help to reduce direct heat transmission when the machine is parked on tropic airfields. Aerodynamically a high wing permits the maintenance of an uninterrupted top wing surface and seems to render wing/fuselage filleting a comparatively simple problem.

On entering the Marathon one is struck by the interior spaciousness. The cabin is wide and the headroom is generous, whilst lightness is given to the volume by the ample window area at each seat station. The standard model has alternative seating arrangements for fourteen or eighteen persons and provides a very real degree of luxury. For one thing, ample leg room is afforded the tall person, and this is a quality often neglected or disregarded. Alternative accommodation layouts are, of course, available, and seating for twenty people can be provided, though this necessarily restricts the operating range. Seating is arranged in pairs on each side of a central aisle, the chairs being built on a steel-tube frame, upholstered in Dunlopillo and rubberized hair, and covered with nylon. Although not adjustable, the seats are comfortable; we would, however, suggest that they could have the back lengthened, perhaps 1½ inches, in



Functional ideals have obviously ruled the cockpit layout.

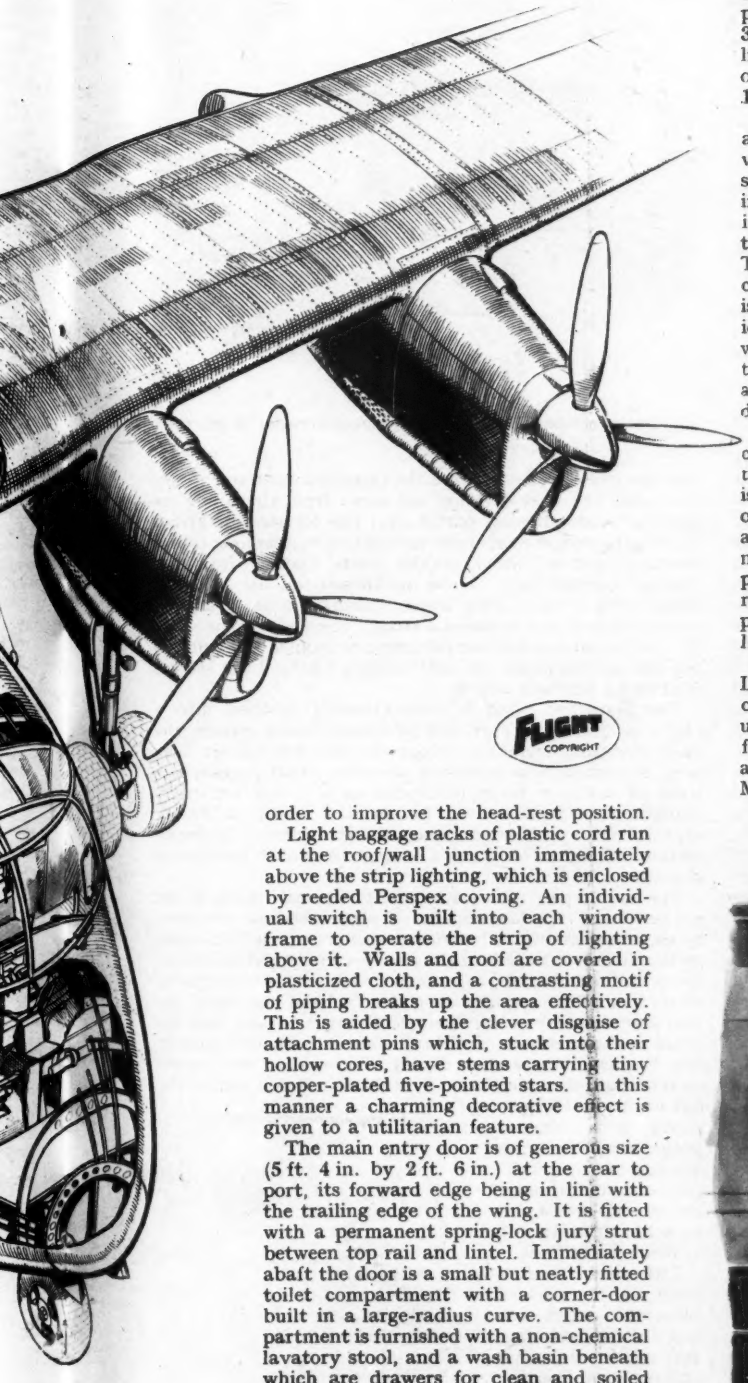
MILES MARATHON



A STURDY ROBUSTNESS IS INCORPORATED WITH CLEAN LINES

THIS special *Flight* cut-away drawing of the Marathon is taken from a viewpoint which admirably shows the surprising capaciousness of the fuselage whilst, at the same time, the essential structural form may be discerned. In particular, the noteworthy roominess of the cockpit is well shown, illustrating the clear access afforded to both pilots' seats, and, too, an impression of the wide field of view from the cockpit may be gained. Primary and engine control cables run up the forward bulkhead and then down the roof central trunk to the centre-section where divergence is made between leads to the wings and tail surfaces.

ATHON . . .



order to improve the head-rest position.

Light baggage racks of plastic cord run at the roof/wall junction immediately above the strip lighting, which is enclosed by reeded Perspex coving. An individual switch is built into each window frame to operate the strip of lighting above it. Walls and roof are covered in plasticized cloth, and a contrasting motif of piping breaks up the area effectively. This is aided by the clever disguise of attachment pins which, stuck into their hollow cores, have stems carrying tiny copper-plated five-pointed stars. In this manner a charming decorative effect is given to a utilitarian feature.

The main entry door is of generous size (5 ft. 4 in. by 2 ft. 6 in.) at the rear to port, its forward edge being in line with the trailing edge of the wing. It is fitted with a permanent spring-lock jury strut between top rail and lintel. Immediately abaft the door is a small but neatly fitted toilet compartment with a corner-door built in a large-radius curve. The compartment is furnished with a non-chemical lavatory stool, and a wash basin beneath which are drawers for clean and soiled towels and clean and used paper drinking cups. The latter are provided for the drinking fountain which is inset in the rear wall of the compartment and, operated by a press button, is served by a tank complete with filter fitted on the rear face of the wall.

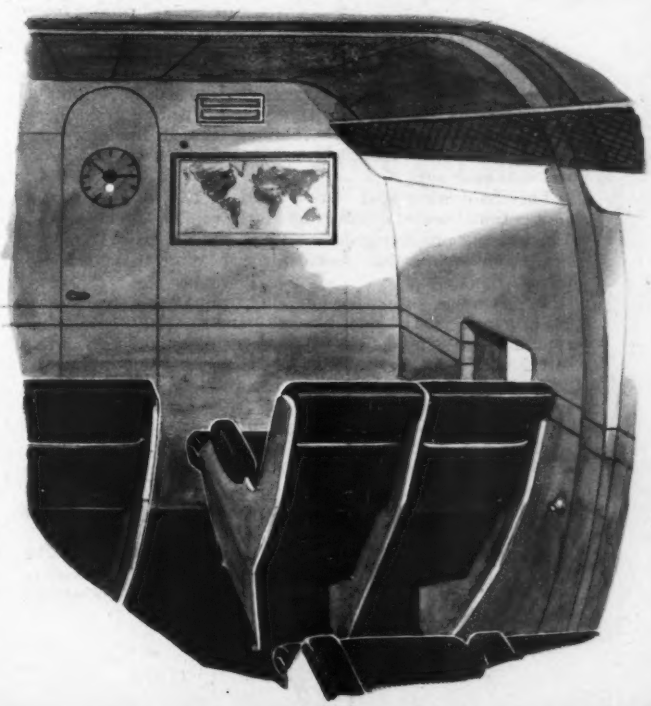
A luggage bay of 164 cubic ft. capacity is provided behind the cabin and is served by a top-hinged loading door 3 ft. 6 in. by 3 ft. 1 in. on the starboard side. Access can also be gained from the cabin by a removable panel about 3 ft. by 2 ft. in the dividing partition. This luggage compartment can be loaded to a maximum height of roughly 3ft. 6in. above the floor (this limit being defined by a red line) and the design load is 1,644 lb. In the after-bulkhead of the luggage bay a top-hinged door, roughly 2 ft. 6 in. by 1 ft. 9 in., gives entry to the tail cone of the fuselage.

Access to the pilots' seats is remarkably obstruction-free and the cockpit is well laid out; it is roomy and has excellent visibility all round. The fact that the wing tips cannot be seen by either pilot may be important or not, according to individual likes and dislikes; however, for taxying purposes it is easy to remember that the wing tips are about twice the distance from the cockpit to the outboard spinners. The front screen is Perspex blown to almost constant-radius curvature; it is a fine job and quite free from distortion. It is also relatively close to the pilots' eyes and—an excellent idea—Miles have introduced a new type of windscreen wiper, the squeegee of which is curved in conformity with the screen, which is mounted horizontally and moved up and down by a mounting tube, through the core of which de-icing fluid is fed.

Another new feature is the employment of a remote-controlled, single-shot, engine-priming system developed by the Heywood Compressor Co., Ltd. In brief, compressed air is fed to each of the press-button air-cocks in the cockpit—one for each engine—operation of which admits pressure to a spring-loaded plunger on the induction manifold. A metered charge of fuel is thus injected and, at the limit of plunger travel, the air is exhausted and the plunger spring returned, so drawing in a fresh charge of fuel for the next priming shot. The advantage of this system is that no fuel lines need be brought into the cockpit.

The control pedestal is well designed and is fitted with Liberator-type ganged throttles. Undercarriage and flap controls are fitted on the upper edges of the box, and are unique in that the levers are hinged so that they can be folded down sideways into gate slots for positive locking—another useful feature. After considerable investigation, Miles have settled on a compromise method of airscrew-

Forward corner of cabin showing chair design, individually-controlled strip lighting, and decorations. It is possible that sliding fitted sun-blinds may be furnished to the windows.



braking control. The actual selection of negative pitch is made by pulling-up the speed control levers to the top end of their gates, and then the throttles are pulled back beyond the normal closed position so that "sense" operation is provided for the braking function.

Mounted separately behind the pedestal is a box carrying on its top the trim-selector. This is a modification of a German switch which has fore-and-aft and lateral rocking movement as well as rotary movement. Fore-and-aft movement of the switch actuates the elevator trim tabs; sideways movement gives aileron trim (there is, however, every likelihood that this will be eliminated as unnecessary); and rotation of the switch governs rudder trim. This convenient scheme is possible as the trim tabs are operated by Miles electric actuators carried in the parent surfaces. The actuators weigh a matter of ounces, and the system has the advantage of eliminating the conventional cables between cockpit and surfaces, their place being taken by a simple electric lead. Trim tabs are complemented by conventional mechanical advantage servo tabs on the starboard rudder and elevator, and on each aileron. As previously noted, the aileron trim tabs will probably be deleted and replaced by ground-setting tabs, although the servo tabs will be retained.

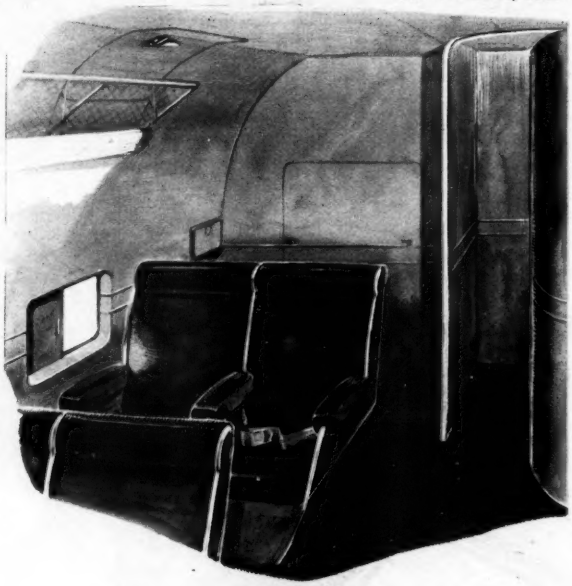
Undercarriage and flaps are pneumatically operated there are no hydraulics in the aircraft—the pneumatic system having a storage pressure of 600 lb./sq. in., which is stepped down to 450 lb./sq. in. for operative use. Emergency lowering of the undercarriage is initiated mechanically, the latch pins of the up-locks being withdrawn by cable from the cockpit so that the nose and main legs fall under gravity and are drag-locked. Emergency operation of the flaps is brought about by switch-over to a separate air bottle, the flap position selections then being made in the normal way.

The fuselage, in common with the whole aircraft, is structurally quite conventional and is fabricated with pressed lipped-channel frames, and drawn Z-section stringers. An unusual point, however, is that the webs of the frames are liberally pierced with lightening holes, this being a contributory factor to the low structure weight of the fuselage. The semi-monocoque structure incorporates channel-section "longerons" reinforcing the lintel and sill lines of the window cut-outs, and where these intersect the wing attachment frames, the latter are pierced by paired tubes through-bolted with the longeron webs on each side.

The main wing spar is not fixed to the fuselage in the conventional sense; it passes across the roof and is enclosed in a box-casing projecting down into the cabin. However, 6ft. headroom is afforded beneath the box so that it is no inconvenience.

The floor is supported on longitudinal and transverse beam members, the floor surface panels being of ply-faced cellular-filled sandwich construction. A neat design detail of the floor structure is that the space between paired fore-and-aft beams on each side of the fuselage is used for the main cabin ventilation ducting, this again affording a useful saving in structural weight. The beams form the side walls of the duct, which is divided into upper and lower volumes by a horizontal membrane, the lower space being devoted to cold air and the upper space to warm air; this has the additional advantage that passengers' feet are kept warm by direct convection.

There are only two-and-a-half bulkheads spanning the Marathon fuselage, these being respectively that dividing the rear luggage compartment from the tail cone of the



Looking aft down the cabin showing curved entry door to toilet.

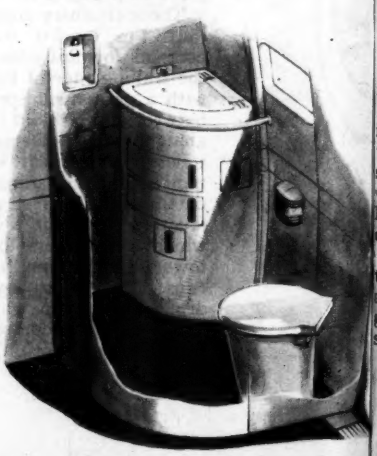
fuselage (the division between the luggage compartment and the cabin and that dividing the cabin from the toilet are ply-faced, non-stressed partitions); the forward bulkhead dividing passenger cabin from the control compartment; and the half-bulkhead which divides pilots' stations from the forward luggage bay. These bulkheads are all similarly constructed of light alloy sheet, stabilized with Z- and L-section vertical and horizontal strips. The doorway between the cabin and control compartment is profiled with drawn top-hat section posts, the half-bulkhead behind the second pilot being similarly edged.

The Marathon wing is conventionally divided into a centre section and port and starboard outer panels, the basic structure of which is of common form throughout. The wing is essentially a monospar structure, that portion forward of the spar being fabricated as a D-box internally supported on girder-braced former ribs, whilst at 70 per cent. chord a subsidiary spar of light pressed channel-section, reinforced with angle booms, runs out to the aileron shroud.

The main spar, which is a straight length member set normal to the fuselage axis, is of plate web and extruded boom construction, the booms being of an especially devised section designed to reduce the need for lengthy attachment-rivets and, in addition, to reduce the amount of machining-swarf loss. The rectangular section body of the boom has two lips, one to pick-up direct to the skin surface and the other to the spar web, the attachment in each case permitting the use of very short rivets. Throughout the centre-section span, the boom body is constant in depth and width, but in the outer wing panels it is tapered progressively in depth though not in thickness; in the outer panels the web lip is lost and attachment to the web is through the body.

Lift and landing loads are transmitted from the centre section to the fuselage through tubular com- compression/tension attachments between the root ribs and the reinforced fuselage frames at the appropriate stations. Drag

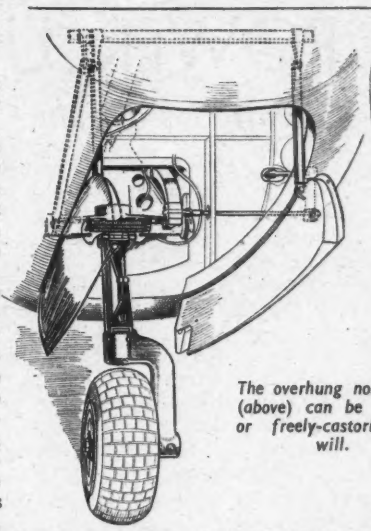
Toilet appointments are neat.



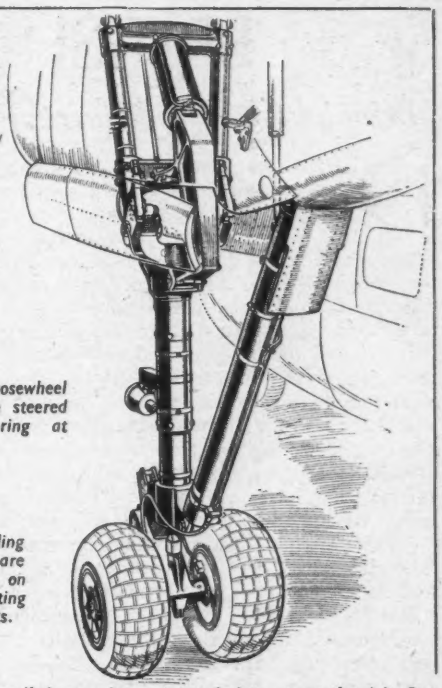
Miles Marathon . . . . .

loads are taken as shear by bolts attaching the lower contour member of the root rib to the fuselage.

The rear spar has a continuous top boom member which spans the fuselage, and picking-up to this on the centre line is a fore-and-aft bolt which acts as a shear member in taking the cross component of the drag loads. Wing ribs are light, built-up, strut-braced members which are pitched fairly close together, those abaft the rear spar having a curved lower profile to accommodate the flap shroud. The outer wing panels are attached to the centre-section immediately outboard of the outer engines, the main spar joint being made with fork-and-lug pin-jointed straps to the booms, whilst the light rear spars are pin-jointed through fish plates.

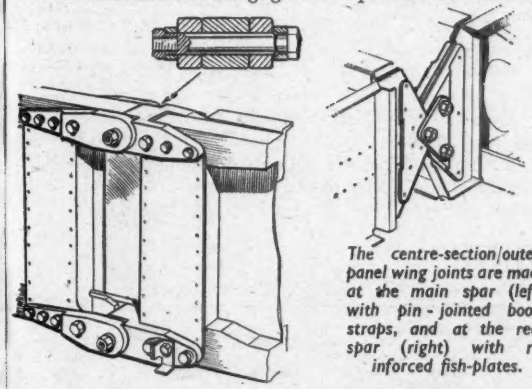


The overhung nosewheel (above) can be steered or freely-castoring at will.



The main landing wheels (right) are lever-mounted on forward-retracting breaker struts.

Fuel tank capacity is broken up into four units, two in each wing totalling 120 gallons per side; the tanks are crash-proof, flexible, bag-type cells. Whilst on the subject, we may mention that the original fuel system was laid out so that each engine was served by its own fuel tank, it having been theoretically established that with one engine out the remaining three engines would, on their own supply, give 85 per cent of the range otherwise available by using the dead engine's fuel. On ranges of the Marathon order this loss was considered negligible compared with the saving



The centre-section/outer-panel wing joints are made at the main spar (left) with pin-jointed boom straps, and at the rear spar (right) with reinforced fish-plates.

of complication and the potential dangers inherent in complicated fuel systems. However, certain operators insist upon having cross-feeds as between the inner and outer engines of each wing, although there is no cross-feed as between the port and starboard installations and thus no fuel line near the fuselage.

The inboard nacelles are hung from the main spar and from doubled nose ribs and the rear spar, whilst the outboard units do not pick-up the main spar; the engine mountings are quite conventional and such as to provide ready access for servicing.

Actuating gear for the high-lift/low-drag flaps is housed in the tails of the nacelles, the flap reaction loads being taken solely through the nacelle structure; each flap is supported at its inner and outer ends by simple guide rails which resist lateral bending. It is worth noting that the Marathon is the only British four-engined commercial aircraft fitted with high-lift/low-drag flaps.

The fuselage is dome-head riveted, as are the wings, with the exception of the first 30 per cent chord where the rivets are flush. Fuselage skin panels vary between 20 and 24 gauge; wing skins vary between 16 and 24 gauge, and tail surfaces between 20 and 26 gauge.

At the rear of the fuselage the top is cut away to accommodate the tailplane, the cut-out being covered with flat decking. Tailplane spars pick up in pin-joint fashion to reinforced semi-frames at the respective stations, the rearward of which takes the main loads. The rudders use a horn-type aerodynamic balance in conjunction with nose mass-balancing, but elevators have no nose balance so the mass-balance weights are externally carried on lever arms. The same thing applies to the ailerons.

The undercarriage is of Miles design throughout and employs the maker's own oleo-pneumatic shock absorber units, the main undercarriage wheel mounting being of the type now known as levered suspension. A useful feature in connection with the undercarriage is that taxying lights are fitted to each main leg, this scheme having, we believe, been experimentally proven in the R.A.F. during the war. The nose wheel can be used either in free-castering self-centring form or, by engaging a mechanical linkage, can be steered by actuation of the rudder pedals.

In the air the Marathon exhibits very pleasant characteristics; take-off is remarkably short and the general noise level in the cabin pleasantly low. The fact, however, that the exhaust pipes of the Gipsy Queen engines emerge on the starboard side of each nacelle makes the port side of the cabin noticeably noisier than the starboard. Despite the fact that most operators would prefer maximum interchangeability of engines to the attainment of minimum noise level, it would be worth while considering a modification to the port inner engine exhaust to eliminate this drawback.

Briefly, the Marathon should supply qualities which are ever increasingly demanded, namely, speed and economy without sacrifice of safety.

MARATHON DATA

Four de Havilland Gipsy Queen 71 Engines of 330 b.h.p. Driving 7ft 6in dia. 3-blade D.H. c.s. feathering airscrews

Span	65ft
Length	52ft 1in
Height	13ft 9in
Wing area, gross	500 sq ft
Aspect ratio	8.5
Flaps area per wing	32.8 sq ft
Gross weight	16,550 lb
Wing loading	33 lb/sq ft
Cabin volume	760 cu ft
Max. speed, at 6,300ft	230 m.p.h.
Max. cont. cruise, at 10,000ft	210 m.p.h.
Recomm. econ. cruise, at 10,000ft	175 m.p.h.
Max. still air range	900 miles
Distance to clear 50ft	815 yds
Initial rate of climb	1,225ft/min
Initial rate of climb, three engines	650ft/min

BRITISH POWER UNITS

Principal Data of Current Aircraft Gas Turbines and Piston Engines

DURING the past year several new power units and new marks of existing ones have been introduced, and, in addition, development work has led to increases in power ratings. On these pages the principal data for all current British engines have been tabulated for reference, and in our next issue illustrations and brief descriptions of many of these power units as displayed at Radlett will be given.

Because of the many special military and civil duties for which power units are designed it is difficult to decide what conditions for power and consumption figures constitute the fairest and most useful basis for comparison. The question of metric measures also arises. It has been decided to give in these tables consumption figures in gallons per hour for the makers' recommended economical cruising conditions. This, it is felt, will provide the potential operator with working figures, and the units will also have an immediate meaning for foreign readers and visitors to Radlett.

Not only has development of gas turbines proceeded satisfactorily but several very important type tests have been completed. Special mention of the Bristol Theseus must be made as this unit became, on January 28th, the first airscrew turbine in the world to hold a type test certificate, and subsequently the first power plant of the type to be put into production. The particular test entailed 156 hours' continuous running without heat exchanger. Metropolitan-Vickers F.2/4 A units also achieved a new high official power rating, and two examples will power the unique prototype S.R. A1 fighter which is to make its first public demonstration at Radlett. The F.2/4 A has been named the Beryl and other Metrovick turbines are in future to be named after precious stones.

Thrust augmentation is a subject which is occupying the minds of many of our gas turbine designers, and work is not restricted only to the ducted and open fans of the Metrovick F.3 and F.5

As the large piston engines become less important for military installation the manufacturers naturally give more attention to the development of civil versions. Two examples are the Bristol Centaurus 630, which is in production for the Ambassador and which corresponds to the previous military 130, and the civil version of the Rolls-Royce Griffon 57 which is shortly to become available.

New Gas Turbines

The names of several new units have been released for which power figures are still awaited. These are the Armstrong Siddeley Mamba 2; the Bristol Pheobus I development engine, Proteus I (a 3,500 h.p. class airscrew turbine) and small Janus I; the de Havilland H.3; and the Rolls-Royce Dart. The Dart, small airscrew turbine, is, of course, well advanced, and is expected to complete its type test and to fly in a matter of weeks.

New engines included in the table, for which figures have been given, are the de Havilland Goblin 3, a high-rated unit installed in the Company's tailless 108, the de Havilland Ghost, and the Napier Naiad.

There is no further news of the development work of the National Gas Turbine Establishment (Power Jets) or, in particular, of the progress with their very small turbine in the 250 h.p. class.

Unfortunately, the development of the very promising Fedden airscrew turbine, the Cotswold, described in detail in *Flight* dated June 26th, 1947, has had to be abandoned, and the future of the company's interesting light aircraft piston engines is also in the balance.

GAS TURBINES

(Compiled by "Flight." Copyright)

Maker's Name and Engine Type	Type of Compressor	No. of Combustion Chambers	Max. Power Rating (Sea Level Static)			Recommended Economical Cruising Power (R.E.C.P.)				Fuel Consumption (R.E.C.P.)	Diam. and Length	Dry Weight	Notes.
			Thrust lb.	Shaft h.p.	r.p.m.	Thrust lb.	Shaft h.p.	r.p.m.	Speed (m.p.h.) and Ht.	G.P.H.	in.	lb.	
Armstrong Siddeley:													
Python	IA	11	1,150	3,670	8,000	950	2,720	7,600	S.L. Static	290	48 & 96	3,150	Weight with intakes but not airscrews. Length from rear face of airscrew hub to rear face of turbine housing.
Mamba	IA	6	320	1,010	14,500	265	747	13,750	S.L. Static	79	27 & 56.3	750	
Bristol:													
Theseus	IA, IC	8	500	1,950	8,200	330	1,180	8,200	300 at 20,000	99	48 & 106	2,310	Weight includes intakes, heat exchanger and mounting.
De Havilland:													
Goblin 2	IC	16	3,000	—	10,200	1,850	—	8,700	S.L. Static	308	49.85 & 100.5	1,550	Weight including tail pipe, nozzle, etc., excluding a/c. auxiliaries.
Goblin 3	IC	16	3,300	—	10,750	2,240	—	9,500	S.L. Static	—	49.85 & 100.5	1,573	
Ghost	IC	10	5,000	—	10,000	2,825	—	8,500	S.L. Static	380	53 & 115.5	2,011	
Metropolitan-Vickers:													
Metrovick Beryl F.2/4 A	IA	1 Ann.	3,850	—	7,750	3,400	—	7,400	S.L. Static	440	37.25 & 129	1,550	
Metrovick F.3 ...	IA	1 Ann.	4,600	—	7,390	3,900	—	—	S.L. Static	319	46 & 140	2,300	Ducted fan.
Metrovick F.5 ...	IA	1 Ann.	4,710	—	7,700	2,300	—	—	400 at 20,000	247	37.25 & 146.5	2,200	Open fan thrust augmentor.
Napier:													
Naiad	IA	5	241	1,500	18,250	268	902	17,000	S.L. Static	96.2	28 & 102	1,095	Weight less airscrew.
Rolls-Royce:													
Derwent V ...	IC	9	3,600	—	14,700	2,675	—	13,600	S.L. Static	345	43 & 83.1	1,280	
Nene I	IC	9	4,500	—	12,000	3,500	—	11,200	S.L. Static	445	49.5 & 96.8	1,640	
Nene II	IC	9	5,000	—	12,300	4,000	—	11,600	S.L. Static	512	49.5 & 96.8	1,640	
Clyde	IA, IC	9	1,225	3,020	6,000	—	—	—	—	—	46.72 & 121.2	2,800	Weight less airscrew.

PISTON ENGINES

(Compiled by "Flight." Copyright)

Maker's Name and Engine Type	Arrangement of Cylinders	Cooling	Bore × Stroke in	Capacity litres	Reduction Gear Ratio	Max. Power Rating b.h.p.	r.p.m.	Boost lb/sq in	ht. (ft)	Recommended Economical Cruising Power b.h.p.	r.p.m.	Boost lb/sq in	ht. (ft)	Take-off Power	Fuel Consumption R.E.C.P. G.P.H.	Dry Weight (lb)	Notes
Alvis :																	
Leonides 501 ...	9 R	A	4.80 × 4.41	11.78	0.5 : 1 0.625 : 1	515	3,000	6.5	5,000	340	2,600	0	11,000	505	21	760 780	Accessories on engine or gear box.
Armstrong Siddeley :																	
Cheetah 15 and 25.	7 R	A	5.25 × 5.5	13.67	0.732 : 1	405	2,425	2.75	4,000	260	2,100	0	S.L.	420 475	15.8	805	Max. W.M. consmpts. for R.E.C.P.
Blackburn :																	
Cirrus Minor II	4 IL	A	3.93 × 4.99	3.99	Drct.	100	2,600	—	S.L.	80	2,200	—	S.L.	100	4.9	234	Major II, lower compression ratio.
Cirrus Major III	4 IL	A	4.72 × 5.51	6.33	Drct.	155	2,450	—	S.L.	125	2,100	—	S.L.	145	8.0	333	
Bombardier ...	4 IL	A	—	—	Drct.	180	—	—	S.L.	—	—	—	S.L.	—	—	—	Underhead camshafts and fuel injection. Supercharged.
Musketeer ...	6 IL	A	—	—	Drct.	265	—	—	S.L.	—	—	—	S.L.	—	—	—	
Grenadier ...	6 IL	A	—	—	—	300	—	—	—	—	—	—	—	—	—	—	
Bristol :																	
Hercules 101 ...	14 R	A	5.75 × 6.5	38.7	0.444 : 1	M.S.1,800	2,800	8.25	9,000	M.S.1,215	2,400	2.5	12,250	1,675	73 71	2,045	R.E.C.P. for all power units is Max. W.M.
						F.S.1,625	2,800	8.25	19,500	F.S.1,125	2,400	2.5	21,000				
Hercules 120 ...	14 R	A	5.75 × 6.5	38.7	0.444 : 1	M.S.1,800	2,800	7.5	6,000	M.S.1,230	2,400	2	10,750	1,715	71 70	2,025	High cruising altitude.
						F.S.1,465	2,800	7.5	23,000	F.S.1,090	2,400	2	25,250				
Hercules 630 ...	14 R	A	5.75 × 6.5	38.7	0.444 : 1	1,795	2,800	7.5	7,250	1,330	2,400	3.25	9,250	1,690	77	1,905	Civil unit (R.E.C.P. for Wayfarer a/c special case).
Hercules 230 and 730.	14 R	A	5.75 × 6.5	38.7	0.444 : 1	2,055	2,800	12.0	3,500	1,305	2,400	3.5	11,500	2,000	77	2,060	Military Unit 230 Civil 730.
Centaurus XVIII, 57, 58 and 59.	18 R	A	5.75 × 7.0	53.6	0.444 : 1	M.S.2,840	2,700	11.5	750	M.S.1,790	2,400	2.5	11,000	2,825	107 105	2,780 2,870	Water/Methanol for T.O. and max. power.
						F.S.2,610	2,700	11.5	14,250	F.S.1,640	2,400	2.5	21,500				
Centaurus XXs	2 × 18 R	A	5.75 × 7.0	107.2	0.400 : 1	M.S.5,160	2,700	9.5	4 000	M.S.3,580	2,400	2.5	11,000	5,000	214		Two coupled 57s (without water/methanol).
						F.S.4,630	2,700	9.5	16,750	F.S.3,280	2,400	2.5	21,500		210		
Centaurus 130 and 630	18R	A	5.75 × 7.0	53.6	0.400 : 1	2,680	2,700	10.75	4,000	1,805	2,400	3.25	9,500	2,600	104	2,980	Military Unit 130 Civil 630
De Havilland :																	
Gipsy Major 10	4 IL	A	4.64 × 5.51	6.12	Drct.	145	2,550	—	S.L.	115	2,300	—	5,000	145	8	312	
Gipsy Major 30	4 IL	A	4.74 × 5.906	6.78	Drct.	160	2,500	—	S.L.	118	2,100	—	3,500	160	7.5	340	
Gipsy Major 50	4 IL	A	4.74 × 5.906	6.78	Drct.	197	2,500	5	S.L.	120	2,100	−1	11,500	197	8	410	Supercharged.
Gipsy Queen 30	6 IL	A	4.74 × 5.906	10.18	Drct.	250	2,500	—	S.L.	181	2,100	−2	3,500	250	12	510	
Gipsy Queen 50	6 IL	A	4.74 × 5.906	10.18	Drct.	295	2,500	—	S.L.	180	2,100	−1	12,000	295	11.5	560	Supercharged.
Gipsy Queen 70	6 IL	A	4.74 × 5.906	10.18	0.711 : 1	345	2,800	+6	7,750	265	2,400	+2	7,750	345	17	660	Supercharged.
Jameson ...	4 HO	A	4.125 × 3.75	3.28	0.619 : 1	110	3,300	—	S.L.	90	2,250	—	—	110	4.78	280	
Monaco ...	4 HO Flat	A	4.375 × 3.625	3.6	Drct.	100	2,800	—	S.L.	85	2,420	—	S.L.	100	4.9	230	
Napier :																	
Sabre VA ...	24 H horiz.	L	5.0 × 4.75	36.7	0.274 : 1	M.S.2,615	3,850	15	2,500	890	2,500	+.5	11,500	2,310	56.7	2,490	Best specific consumpt. stated. Mk. VII with water/methanol.
Sabre VII ...	24 H horiz.	L	5.0 × 4.75	36.7	0.274 : 1	M.S.3,055	3,850	17.25	2,250	900	2,500	+.5	11,750	3,000	55.7	2,540	
						F.S.2,760	3,850	17.25	12,500								
Nuffield : ...	4 HO	A	4.375 × 3.875	3.82	Drct.	100	2,600	—	S.L.	70	2,300	—	—	100	4.25	—	
Rolls-Royce :																	
Merlin 140 ...	12 V	L	5.4 × 6.0	27	0.512 : 1	M.S.1,780 1,980	3,000	20 25*	4,500 S.L.	M.S.1,200	2,650	9	10,250	1,725	79 89	1,780	2-speed, 2-stage, contra-rot. airscrew.
						F.S.1,650 1,830	3,000	20 25*	16,750 13,000	F.S.1,185	2,850	9	23,750				
Merlin 500 ...	12 V	L	5.4 × 6.0	27	0.420 : 1	M.S.1,635	3,000	18	2,250	M.S.1,080	2,650	7	8,750	1,610	71.5 71	1,540	2-speed, 1-stage. Max. cont. cruising power for R.E.C.P.
						F.S.1,510	3,000	18	9,250	F.S.1,015	2,650	7	15,500				
Merlin 600, 620, 621.	12 V	L	5.4 × 6.0	27	0.420 : 1 0.471 : 1	M.S.1,780	3,000	20	4,500	M.S.1,180	2,650	9	10,500	1,725	76 84	1,740	2-speed, 2-stage.
						F.S.1,655	3,000	20	16,750	F.S.1,165	2,850	9	23,750				
Griffon 57 ...	12 V	L	6.0 × 6.6	36.7	0.4423 : 1	M.S.2,005	2,750	18	1,500	M.S.1,390	2,400	9	6,500		88	2,020	Contra-rot. airscrew. Water/Methanol.
						F.S.1,830	2,750	18	9,750	F.S.1,195	2,400	9	12,750	2,450	86		
Griffon 74 ...	12 V	L	6.0 × 6.6	36.7	0.451 : 1	M.S.2,100	2,750	18.5	S.L.	M.S.1,315	2,400	7	7,750	2,100	84.5	2,090	
						F.S.2,140	2,750	25	9,250	F.S.1,244	2,400	7	18,750		85.5		
Griffon 88 ...	12 V	L	6.0 × 6.6	36.7	0.4423 : 1	M.S.2,035 2,350	2,750	18 25*	7,000 1,250	M.S.1,305	2,400	7	12,250	1,935	86	2,150	Contra-rot. airscrew.
						F.S.1,820 2,120	2,750	18 25*	21,000 16,000	F.S.1,215	2,400	7	25,000		91		
Griffon 121 ...	12 V	L	6.0 × 6.6	36.7	0.442 : 1	L.S.2,440	2,750	25*	6,000	L.S.1,313	2,400	7	16,250		90	2,150	Contra-rot. airscrew.
						M.S.2,300	2,750	25*	15,750	M.S.1,253	2,400	7	24,000	1,900	94		
						F.S.2,085	2,750	25*	23,000	F.S.1,165	2,400	7	31,750		98		
Eagle	24 H	L	5.4 × 5.125	46	0.299 : 1	M.S.3,500	3,500	21	3,250	M.S.2,320	3,100	9	10,250	3,415	157	4,220	Sleeve valves.
						F.S.3,020	3,500	21	15,250	F.S.2,180	3,100	9	20,000		161		Contra-rot. airscrew.

Abbreviations :—*Cylinder Arrangements*, R = Radial, IL = Inverted in line, H.O. = Horizontally opposed, H = H-form layout, V = Vee-form layout. *Cooling*, A = Air, L = Liquid. *Supercharging*, L.S. = Low, M.S. = Medium, F.S. = Fully or High, S.L. = Sea level. *Gas Turbines, Compressors*, 1A = Single stage axial, 1C = Single stage centrifugal. 1 Ann = Annular combustion chamber. *=100/150 grade fuel.

THE MILES M.68

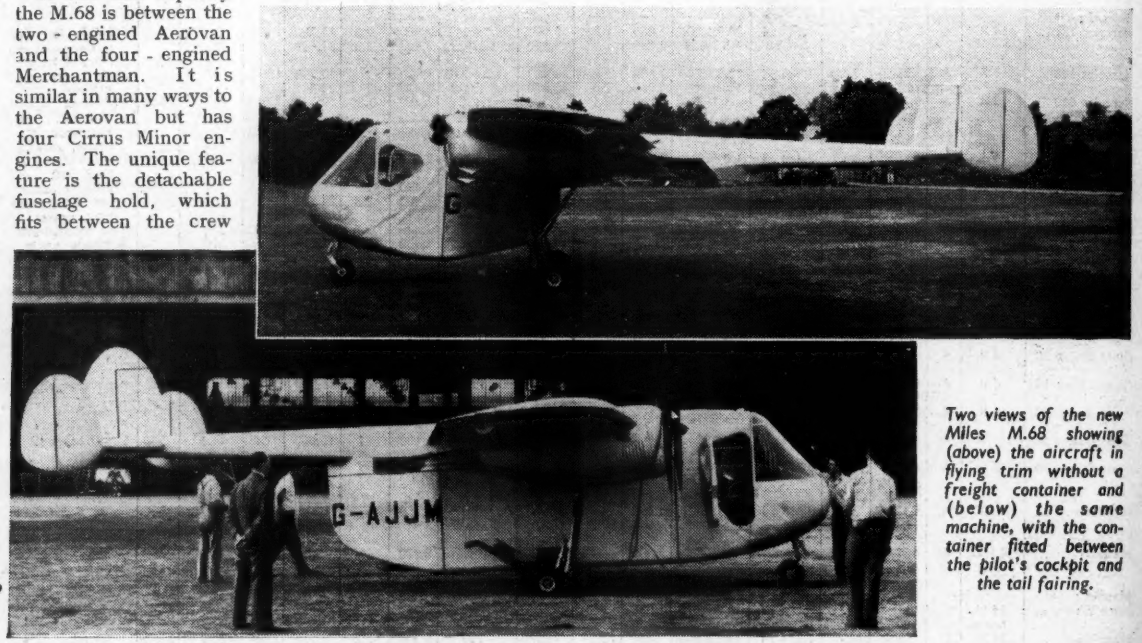
Revolutionary Design Based on the Aerovan : New Four-engined Light Freighter

IT may be said that Miles Aircraft are pioneers in the design of modern, light, freight-carrying aircraft. The Aerovan, which has been in service for many months, is truly the one-ton truck of the air, and its unusual proportions are now recognized to be logical and most suitable for the purpose. Recently the similar but larger all-metal Merchantman with four Cirrus Major engines made its first flight. A full description of this machine was given in *Flight* last week. Miles have now gone a step farther in freighter design, and a new aircraft, so far unnamed but bearing the type number M.68, has just been announced, following its first flight at the Miles airfield at Woodley.

In size and capacity the M.68 is between the two - engined Aerovan and the four - engined Merchantman. It is similar in many ways to the Aerovan but has four Cirrus Minor engines. The unique feature is the detachable fuselage hold, which fits between the crew cabin and a tail fairing. In addition to being detachable, this large rectangular section of the fuselage is provided with removable road wheels and a towing bar which enable it to be used as a trailer for road transport to and from the airport. The standard air-trailer is 10ft long and of 4ft 6in square section, but the dimensions could be varied slightly to suit specific purposes.

It is hardly necessary to point out the great advantages of such a revolutionary arrangement, but the intention is obviously to fly one fully loaded container to its airfield destination, replace it with another fully loaded container for another destination, thereby reducing the turn-round time to the minimum and avoiding the necessity of unloading and reloading the goods, or, in fact, of disturbing them in any way. It is intended that commercial users should order as many containers as they require and have them specially fitted to suit their own particular goods.

As an example of the special use to which the detachable container can be put, one foresees the loading of goods at the factory; the examination and sealing of the container following Customs inspection; the checking of centre of gravity purely by observing the balance of the container on its two road wheels; the recording of weight by running the wheels over scales; the towing of the container on its own wheels to the airport; and, after attachment to the aircraft, the flying of the whole unit undisturbed to its destination. The absence of intermediary handling of the goods, and the tremendous saving in time, will not only make the air-carriage of freight much more attractive but should greatly reduce the overall cost.



Two views of the new Miles M.68 showing (above) the aircraft in flying trim without a freight container and (below) the same machine, with the container fitted between the pilot's cockpit and the tail fairing.

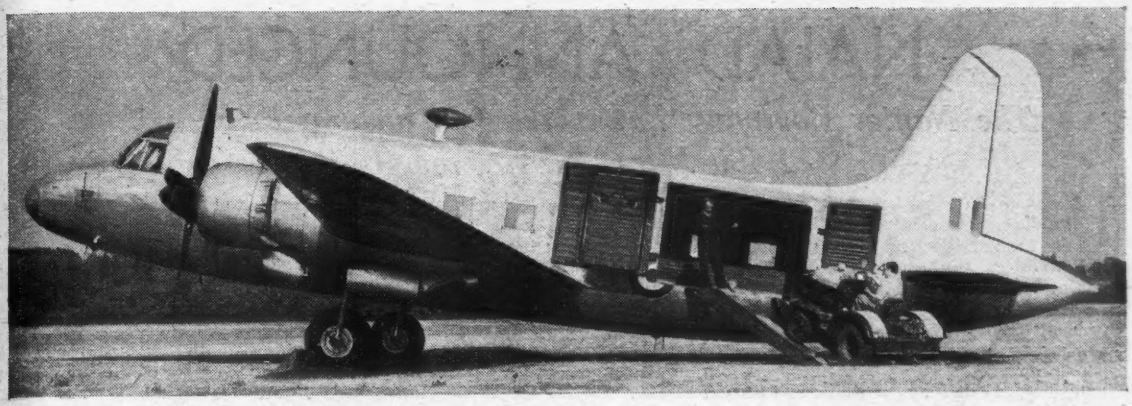
MILES M.68
Four Blackburn Cirrus Minor 100 h.p. Engines

Span	50ft
Length	36ft
Cruising speed	130 m.p.h.
Payload	1,600 lb
Fuel capacity	100 gallons
Max still-air range	800 miles
Range with full payload	400 miles
Detachable freight compartment	
Length	10ft
Height	4ft 6in
Width	4ft 6in

The tail fairing of the fuselage can, if necessary, be attached directly to the rear wall of the pilot's cabin, and the aircraft flown without the central air-trailer section.

With full fuel load of 100 gallons the maximum still-air range is 800 miles, while with a payload of 1,600 lb the range is 400 miles at a cruising speed of 130 m.p.h. The wings, boom and tail are virtually the same as for the Aerovan, and the span of 50ft and length of 36ft are also the same. However, in place of the two Cirrus Majors, four Cirrus Minors have been installed, giving an additional 100 h.p. total. The pilot's cockpit is also quite different in appearance from that of the Aerovan.

The nose-wheel undercarriage resembles a mixture of the Marathon and Messenger undercarriages. Fixed main legs of the Miles' oleo-pneumatic articulated type project through the inboard engine nacelles and each carries small twin landing wheels. A fully duplicated braking system is provided.



The Valetta C Mk I can be adapted for a number of transport duties. In freighter form, as above, the large double-entrance door makes possible the carriage of vehicles, guns, etc. An alternative load would be 36 troops.

NEWEST R.A.F. TRANSPORT

Vickers Valetta with Two Bristol Hercules 230s Now Flying

A VALUABLE new addition to the transport fleet of the Royal Air Force is the Vickers Valetta C Mk. I. It may be regarded as a modified form of the Viking IB, the principal differences being in the equipment, crew arrangements and power plants. The provision of a large, double-entrance door to the fuselage and heavily reinforced flooring make the Valetta suitable for use as a heavy freighter as well as for troop transport, and, in addition to these primary duties, it may be equipped for the carriage of paratroopers and their equipment, for glider towing, supply dropping or ambulance work.

The two Bristol Hercules 230 engines together give 600 extra horse power for take-off, and although the Valetta's permissible all-up weight of 36,000 lb is 2,000 lb more than that of the Viking IB, the already excellent take-off, climb and single-engine performance should be improved.

In its primary rôle as troop carrier, the Valetta has accommodation for a maximum of 36 men, and under these circumstances the range is 255 nautical miles at its cruising speed of 150 knots. If 30 men are carried the range is increased to 630 miles. Considerable attention has been paid to the comfort of the troops, and the cabin is air conditioned, ventilated and sound-proofed. Oxygen is provided for crew and passengers, and a ten-gallon tank of drinking water is situated at the aft end of the cabin. There are fourteen windows for the cabin, all of which are designed as pull-in escape hatches. The seats in the cabin are arranged facing aft and all are built to withstand 25 g in a forward direction in the event of a crash landing.

PRINCIPAL DATA

Span	89ft 3in
Length	65ft 2in
Height	19ft 6in
Gross wing area	882 sq ft
Wing loading (max a.u.w.)	49 lb/sq ft
Structure weight	11,201lb
Bare weight	20,229lb
Basic weight (with crew)	24,980lb
Max all-up weight	36,000lb
Max fuel capacity	724 gal
Max speed	255 kt at 3,000ft
Recommended cruising speed	183 kt at 10,000ft
Ceiling	21,5000ft
Climb (max a.u.w.)	8 min to 10,000ft

When equipped as a paratrooper the Valetta accommodates either ten or twenty men, and up to nine 350-lb containers. Under these circumstances the range varies from 415 to 1,300 nautical miles, while for ambulance duties and a maximum of twenty stretcher cases plus two sitting cases and two orderlies can be carried.

As a freighter the Valetta can carry 6,850 lb for 1,000 miles, and the entry doors are large enough to permit the carriage of a jeep or guns. Finally, as a glider-tug the Valetta can tow an aircraft of up to 17,000 lb total weight.

The roomy and well-laid-out cockpit and crew compartment will commend themselves to squadrons equipped with Valettas. Two pilots, a navigator and a radio operator are carried.

NAIAD ANNOUNCED

The Napier Company Enters the Gas-turbine Field : New 1,590 E.B.H.P. Airscrew Unit

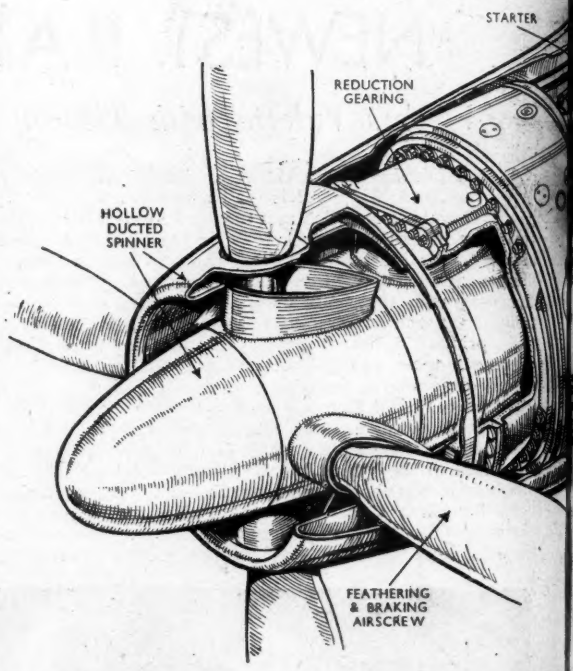
IT was to be expected that the Napier Company, the producers of such outstanding aircraft power units as the Lion, Dagger and Sabre, would not long delay the design and development of gas turbines to supersede their present conventional piston engines. The introduction of the Naiad airscrew turbine has been eagerly awaited, and from an exterior examination and the limited information which may be released it may be said that this unit is most promising. The operating speeds are rather higher than those of other similar units, and this offers advantages in efficiency and therefore economy. The dimensions, in particular the diameter of only 28in, have been kept very low, and from the aircraft engineer's point of view the Naiad should lend itself to a very neat and compact installation.

Although the Naiad is the first Napier gas turbine to be announced, it is not the first design produced by D. Napier and Son, Ltd. Several studies were made prior to the Naiad, and the design of one, to be called the Nymph, was completed, but later developments caused it to be shelved. The Naiad first ran earlier this summer, just over twelve months after design started, and very satisfactory running has now been achieved. The unit which will be shown at Radlett will be equipped with a four-bladed Rotol airscrew.

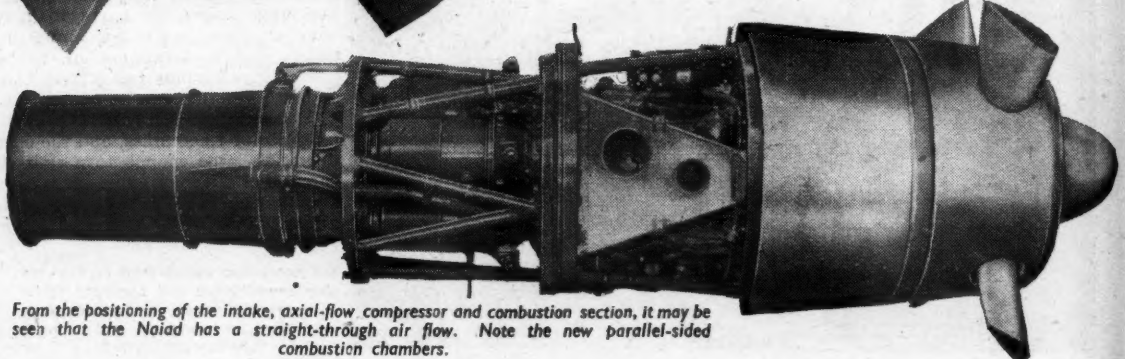
Credit for the design and production of the Naiad is due to a Napier team headed by Mr. H. Sammons, chief engineer, Mr. H. Barlow, who is in charge of design, and Mr. H. A. Penn, who is an expert on compressors.

Both Dagger and Sabre piston engines had high operating speeds, and experience with Sabre reduction gearing and supercharger impellor drives was directly applied to reduction gear design problems on the Naiad. Another feature peculiar to the Naiad is the hollow spinner adopted, following earlier successful development work in connection with air intakes for annular radiators. A Sabre-engined Tempest was used for flight testing of these annular intakes.

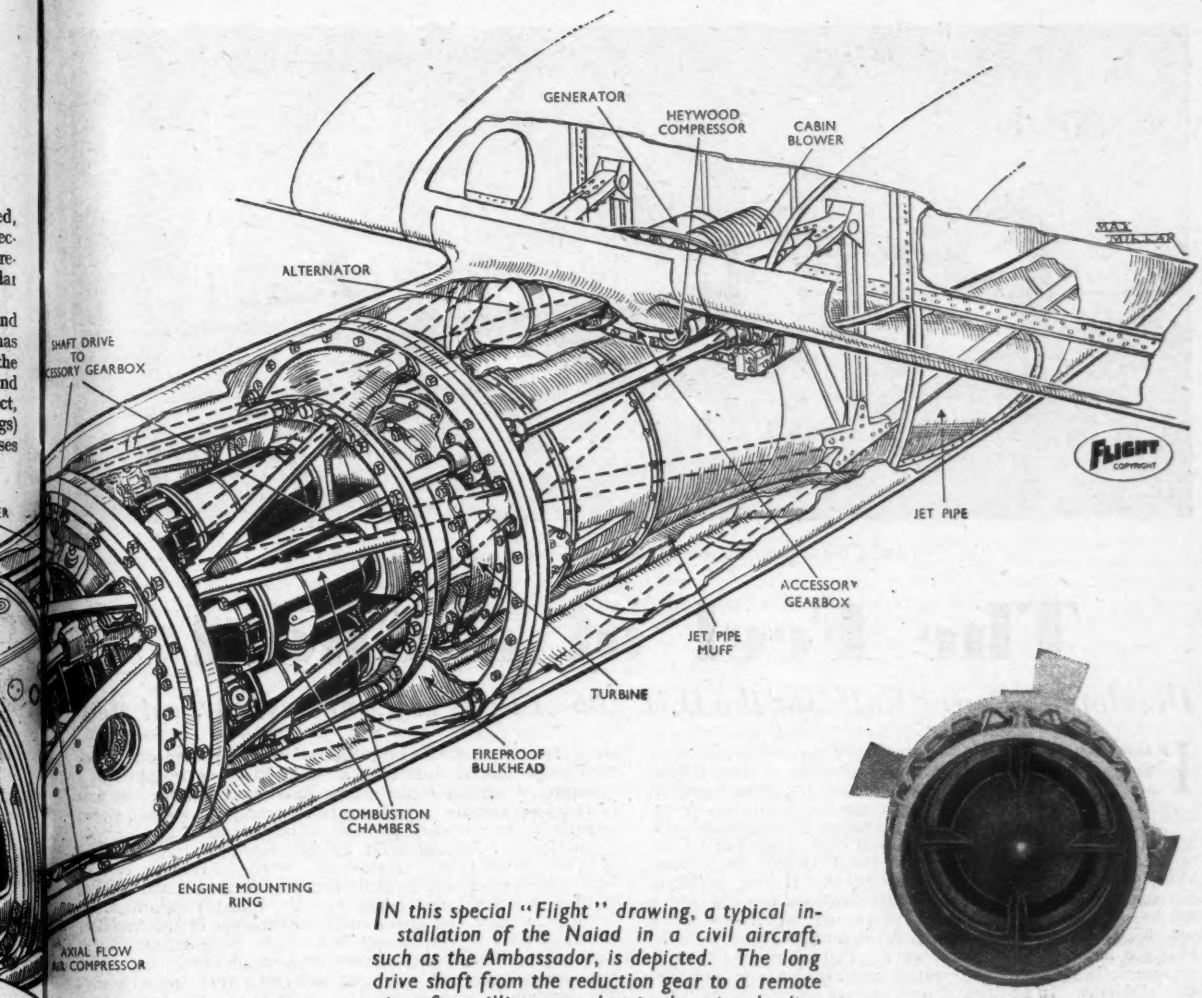
One does not hear so much about straight-through and reverse-flow layouts these days. However, the Naiad has a truly straight-through flow. Air enters through the annular opening between the inner cone of the spinner and the outer spinner ring. Full use is made of the ram effect, and the airscrew shanks (which have streamlined fairings) are the only obstructions in the intake. The air passes directly into an axial-flow compressor and from there is fed into five sturdy-looking parallel-sided combustion chambers arranged revolver-wise around the turbine shaft. The gases finally pass into the turbine and out through the jet pipe. The cylindrical combustion chambers have just



Apart from indicating the neat frontal aspect of the Naiad this picture shows some details of the air intake and hollow spinner.



From the positioning of the intake, axial-flow compressor and combustion section, it may be seen that the Naiad has a straight-through air flow. Note the new parallel-sided combustion chambers.



IN this special "Flight" drawing, a typical installation of the Naiad in a civil aircraft, such as the Ambassador, is depicted. The long drive shaft from the reduction gear to a remote aircraft auxilliary gear box in the wing leading edge is noteworthy. The position of the jet pipe outlet could be varied to suit a particular installation, and the outlet can itself be fitted with a two-position control of orifice area.

The Naiad from the rear roughly to scale with the front view opposite. About 6 per cent of the maximum power is provided by residual thrust.

replaced an earlier tapered design. The turbine, both from exterior examination and consideration of ratio of b.h.p. to residual thrust, appears to be of the two-stage type.

The section of the unit ahead of the compressor contains the reduction gear and accessories drives. The accessories themselves are grouped neatly around the compressor casing, well within the natural line of the long cowling.

The Naiad is started by an electric motor and a single igniter plug. A second igniter is provided, but this is held in reserve. The main auxiliaries are: a 24-volt starter motor, two fuel pumps, oil and metering pumps, oil filter and airscrew governor and braking control. In addition a long horizontal shaft of 50 h.p. (or more if required) transmission capacity can be provided to drive a remote gear box for aircraft accessories. The direction of rotation of the engine itself is right-hand tractor.

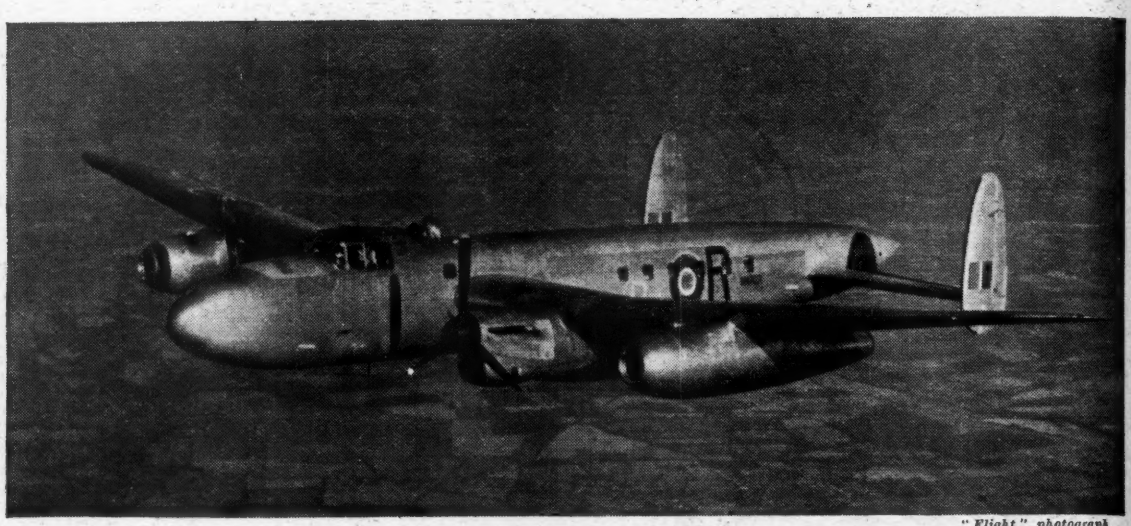
Early installation drawings and models provide for a mounting well forward of the wing leading edge, and the jet pipe passes conveniently under the wing. This arrangement might not be so convenient for inboard power units, and either a bifurcated layout or a jet pipe through or over the wing might, therefore, be required. The propelling nozzle can be supplied with a two-position control for the orifice area if this suits the aircraft requirements. One would be for take-off and climb, the other for cruising.

The main engine mounting ring is attached to the compressor casing and is located at approximately the mid-section of the engine. The unit is in effect encased by its frame and cradle, which comprises three steel rings interconnected by tubular members arranged in V-form.

The Naiad has not yet flown, but it is known that there is at least one civil application in mind, namely, an Airspeed Ambassador adapted to take four Naiads in place of its two Centaurus. Certain military installations have also been under consideration for some time. In this connection it should be remembered that power units in pairs have found favour both for installation in the wings of a multi-engined aircraft and in the fuselage of a twin.

Principal Data and Estimated Performance

Max diameter					28in
Length (spinner to turbine outlet flange)					8ft 6in
Weight, ± 2½ per cent					1,095 lb
S.L. Static	R.P.M.	B.H.P.	Net Jet Thrust	Total E.B.H.P.	Consumpt. g.p.h.
Max take-off (I.C.A.N.)	18,250	1,500	241	1,500	128.8
Max take-off (tropical)	18,250	1,194	204	1,270	112.3
Max cruising	17,000	902	268	1,005	96.2



"Flight" photograph.

The first of two Lancastrians with de Havilland Ghost jet units installed outboard.

The Feel of a Ghost

Developing Power Units for the D.H. 106 : Flight in Lancastrian Test Bed

IF one happens to be feeling depressed about the unsatisfactory state of affairs regarding availability of large British aircraft, and the unfortunate necessity of using American Constellations on the North Atlantic service, it is always comforting to think that at least good progress is being made with gas turbine power plants for future aircraft, and that several advanced machines, in particular the D.H.106, are coming along. The 106 is still a long way off, and no one, certainly not the de Havilland company, underestimates the task which has been undertaken. However, preliminary experience which will be of great importance in developing the 106 is being obtained at present in several ways. The tailless D.H.108 is, of course, being used for research into aerodynamic and control problems. In addition, Ghost engines are now being flown on a development schedule directly related to the 106. For high-speed high-altitude tests a Ghost has been installed in a Vampire, while for other engine development work the first of two Lancastrians, which are being converted to take Ghost engines in the outboard position, is now flying.

The underslung Ghost nacelles are very neatly cowled indeed. Note the circular air intake which feeds direct to the eye of the single-sided impeller.

On Monday, September 1st, *Flight's* representative examined and flew in this first Lancastrian. The particular pair of Ghosts are very neatly cowled, and have single circular intakes in the noses of the underslung nacelles, thus taking advantage of full ram effect and direct entry into the eye of the impellor. No inner cone or "spinner" is fitted in the intakes. These Ghosts are rated at a maximum of 4,500 lb thrust each, and as a start the accent is to be placed on reliability and economy. The first aim is to pass the civil-type test and obtain an overhaul period of 240 hours. Fuel consumption is naturally on the high side on the two aircraft in use, the Ghost Vampire because the bifurcated air intakes were designed for the smaller Goblin, and the Lancastrian chiefly because of its relatively low speed. In the Vampire the figure is about 1.29 lb/hr/lb and in the Lancastrian 1.13 lb/hr/lb. For the 106 a figure of 1.1 is the aim. This would be about as good a figure as could be hoped for with the low compression ratio (4 : 1) given by the present centrifugal compressor.

Impressive Performance

The second Lancastrian is to have Ghost installations more closely resembling those planned for the 106, and the aircraft accessories and cabin blower will be mounted beside the engines. Actually, on the 106, these will be placed between pairs of Ghosts and will have alternative drives from either power unit as a provision against failure of either one. To date, the Lancastrian has provided sixty engine hours of experience. A speed of 330 m.p.h. has been achieved at 20,000ft on four engines, and 275 m.p.h. at 10,000ft on Ghosts alone.

The surge of power on take-off at Hatfield was impressive, and the Lancastrian (flying at medium weight) was airborne in 700 to 800 yards. The climb was also remarkable for the type. Once the Merlins were feathered, the aircraft sailed around at about 5,000ft in that glorious, effortless and fascinating manner which characterizes flight on pure jet power. Noise from the power units is undetectable in the partially silenced Lancastrian cabin, and the slight rumble and whistling is "built into" the airframe. The only indication one has that the aircraft is not gliding is the very slight vibration which can be detected if a portion of the structure is firmly grasped.

If the 106 can operate with the speed of the Vampire, and even the sweetness and near-silence of the old Lancastrian, it will make long-distance air travel a pleasure.

American Newsletter

Airport Problems : Delays at Idlewild : Some Criticisms of Passenger Accommodation in the DC-6

By "KIBITZER"

AS of August 1st, 1947, the much-discussed and as yet unfinished 4,900-acre airport that is to be New York's finest, is still Idle and still Wild. The latest date now put forward for its full-dress operation is July, 1948, quite an extension on the previous opening dates. The history of this venture has been a sad one, and the suggestion put forward in this Newsletter of March 14, 1946, that Heathrow might prove to be the Tortoise which got home first seems to have been correct.

The chief difficulties that have hampered the development of Idlewild have been political, financial, geographical, and constructional. The two former, which were intimately connected both with one another and with other local matters, now seem to have been ironed out, but the two latter are of the sort that must confront any city that sets out to build an airport out of pretty well nothing. Idlewild has been reclaimed from a shallow inland bay, with a preponderantly sandy bottom. This was done by syphoning the sand up on to the area to be reclaimed and thus deepening the bay, utilizing surrounding marshy waste land wherever possible. This work is now virtually completed, concrete runways have been laid across it, and a breeze-block terminal building put up as a temporary structure. But that is as far as things have got. A labour dispute has stalled the installation of telephone and teleprinter lines, and it has been found that the temporary buildings are now far too small for what will be expected of them. Moreover, and worse than anything else, as soon as the wind blows (and it is an area not far from the Atlantic which is subject to strong sea breezes) the sand blows over everything up to a height of several hundred feet. A form of beach-grass has been planted to prevent this, but it is doubtful if it will be all that effective, and certainly not until next year.

Other improvements and additions are required also. No express highway or railway extension has been made to the field, and the existing aircraft servicing facilities would be entirely inadequate. Bus lines would have to be instituted, and the customs and immigration facilities much enlarged over those originally planned, if they are to take care of international traffic.

So, in the meantime, La Guardia bears the brunt of the traffic, with a certain amount of domestic operation in and out of the rather inaccessible Newark Airport (inaccessible, that is, to New Yorkers). In a few weeks it is hoped to use the local U.S. Navy airport at Floyd Bennett Field, which was originally designed for civilian use but later taken over by the Navy, and which is now to be rented, or part-rented, by the City of New York, in order to relieve La Guardia of some of its load. The foreign carriers may well use this terminal, for there are good runways, good approaches, and bad-weather landing aids already in existence. It also has fairly satisfactory road facilities for the journey into New York.

Out in California the new Los Angeles Municipal Airport has begun operation, and most of the airlines have moved their headquarters from the old Lockheed Airport at Burbank to new premises at Mines Field. Landing aids such as high-intensity lighting and G.C.A. are being put in, but the chief interest lies in the fact that a Fido (fog dispersal) unit is to be installed soon. Sea fog is very common in that area during the summer, and the winds that accompany it are light. The airlines reckon that to divert a flight to one of the inland airports costs them between 350 and 400 dollars a time, and during the busy morning hours (when fog is most prevalent) they have have several such diversions per airline. The cost of the Fido operation will be borne by the airlines using the field.

MOST of the major airlines here are now using the new 52-passenger DC-6 for their one-stop cross continental runs. Only T.W.A. sticks to its Constellations. Like every new aircraft, the DC-6 has had its troubles, but many of these are now cured. To start with, the electrical maintenance work was unduly heavy, and considerable passenger discomfort was experienced due to a mysterious vibration of the whole fuselage. Heavy rubber matting in the fore part of the cabin has helped damp this out from the passenger seats, but it is still noticeable and is quite unpleasant when trying to sleep. The seats, too, are not nearly as comfortable as they should be. When sitting up straight they are passable, but when they are tilted back for sleeping they certainly give an uncomfortable ride. The support for one's back seems to be entirely wrong, and one finishes a night journey with a sore rump and a pain in the neck! Also the seats go back too far for the comfort of those behind. The airlines really should do better than this, although comfortable seating is not a strong point in American transportation as a whole. An added discomfort, anyhow as far as the rear seats are concerned, is a bad fuselage whip, which originates in the tail and which, even in moderately rough air, gives the last sixteen passengers an uncomfortable ride.

So far as performance goes, however, the DC-6 is excellent—and the handling characteristics are good. The cockpit layout is particularly nice, but with the large number of engine and other controls one can't help thinking that a flight engineer should be carried. The pilot's checklist for take-off contains 31 items, and the landing one 17!

Normal operating height is 19,000ft and the engines are run at about 128 b.m.e.p. in high blower, which gives 1,000 h.p. from each engine and a true cruising speed of approximately 300 m.p.h. The cabin equivalent pressure varies between 7,000 and 9,000ft, and the consumption is about 350 U.S. gallons per hour. On one airline check, when the engines were being operated at only 900 h.p. each (120 b.m.e.p.) the following figures were noted: Height, 18,000ft, cabin pressure altitude 7,200ft; indicated airspeed 210 m.p.h.; outside air temperature 40 deg F; boost 29.5in H.G.; r.p.m. 2,100. The take-off power for the four Pratt & Whitney R.2,800 engines is 2,100 h.p. each, and the all-up weight of the aircraft is 84,000 lb. Reversible airscrews are fitted, and although at first some minor adjustment troubles prevented their use, they are now cleared for normal operations and are most effective. The noise level is about average, and ventilation is satisfactory. As an aircraft it's good; but oh! those seats!

Expensive Research

THE lengths to which the manufacturers of this country can go, both in imagination and finance, in order to complete adequate research into aviation matters is always a matter of envy. But the individual firms' research projects fade out beside the Army's new "All-Weather" Test Hangar at Eglin Field, Florida. This insulated building, some 200ft x 250ft x 60ft, is designed to give any sort of climatic conditions that are required. The hangar is big enough to take a B-29 together with various other types, and ground equipment can also be checked in any desired temperature from 160 deg F to something like minus 70 deg F. It is said that rain storms and hurricane-force winds can be simulated. Various ground rigs also enable undercarriages, hydraulics, guns, brakes, and such like, to be tested under these extreme conditions. Previously most of the cold-weather testing had been done up in Alaska, but it was a slow business; and even if all the snags do not show up in the "All-Weather" hangar, an enormous

American Newsletter . . . . .

amount of work can be done in it in a short time and with the minimum of expense. The aircraft manufacturers are expecting to use this, too, and presumably their contributions for so doing will help pay for the original cost, which is said to be in the neighbourhood of 10,000,000 dollars.

Pioneer Production

THE new Northrop Pioneer, a three-engined conventional high-wing transport, designed for short-haul cargo work, has been progressing only slowly. The first flights indicated that one or two aerodynamic modifications would be necessary, and Wright engines have been fitted in place of the Pratt & Whitneys. Also, the manufacturers are by no means sure of a big enough market to make the machine worth while building, and until they can get a more positive indication of sales they do not feel like laying down a production line. Once the modifications are finished, however, they will probably do some demonstration flights around North and Central America and then see.

The Civil Aeronautics Authorities have also asked them for a design study of a castering undercarriage for this machine. Such an undercarriage would be of the greatest value in the type of work for which the Pioneer is intended, and it seems quite possible that if the design study is successful they might go ahead and fit such a modification to the aircraft as standard. Several other manufacturers have been asked for similar studies: Bellanca, Beech, Ercoupe, and one for a D.C.3. This programme indicates the importance that the authorities here attach to this idea, and from the flight trials already made with a Fairchild trainer and a Piper Cub, it seems certain that the introduction of this type of cross-wind undercarriage will improve the utilization of small aircraft, and perhaps the medium-sized ones as well. There are many towns which cannot lay out large airfields with several runways—either because of financial restrictions or because of geographical limitations—and the ability to land across-wind without danger would solve their problems by allowing them to have just one—or at most two—runways.

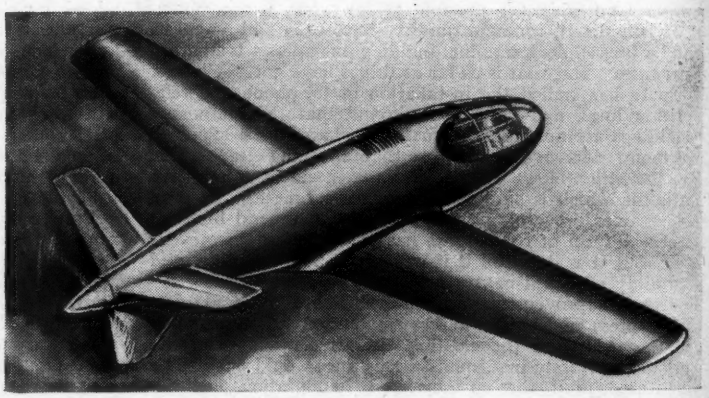
For any operator interested in the life of an aircraft, a survey of DC-3 users here has revealed the following remarkable flying-hour figures for this machine: Eastern Airlines have one that has done 35,000 hours; United Airlines one that has logged 33,000 hours; and T.W.A. a veteran of 34,000. All the major operators have aircraft that have done over 30,000 hours!

Satellite on the Way

Progress with Planet Aircraft's New Design: Alternative Version with Gipsy Major Engine

IT had been hoped that the Planet Satellite would be ready for exhibition at Radlett this year, but it is understood that various problems—power supply earlier in the year and delivery of bought-out components—have caused serious delays since last November when some preliminary details were given in *Flight*. The aim is now to begin flight trials during October. Readers may refresh their memories with regard to the general characteristics of this interesting new design from the accompanying drawing by our artist. The machine is an all-metal four-seater with retractable tricycle undercarriage and a "buried" engine located behind the cabin and driving the airscrew at the tail via a long shaft.

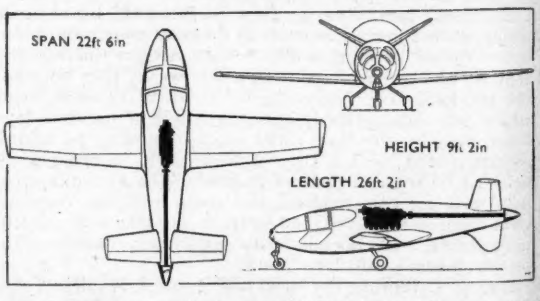
Magnesium alloys are being used extensively in the manufacture of the Satellite, and the majority of the units will be assembled by welding. The fuselage rear section is a detachable monocoque structure, and the wings are semi-monocoque. The upper and lower wing skins, the upper being the thicker, are progressively reduced in thickness towards the wing tips. Vertically corrugated ribs, butt-welded to the skin, divide the wings into bays, and at the rear of these bays there is a common spanwise channel member.



A "Flight" artist's impression of the Satellite.

PLANET SATELLITE

	Gipsy Queen 31	Gipsy Major 10
Max take-off power	250 b.h.p.	142 b.h.p.
Economical W.M. cruising power	181 b.h.p. at 3,500ft	110 b.h.p. at 5,000ft
Max S.L. speed	208 m.p.h.	173 m.p.h.
Max W.-M. cruising speed	191 m.p.h.	161 m.p.h.
Stalling speed, max load	62 m.p.h.	54 m.p.h.
Max range, full load	1,000 miles	500 miles
Fuel consumpt, max W.-M. cruising	17.0 m.p.g.	24 m.p.g.
Initial rate of climb, full load	1,450ft/min	950ft/min
Absolute ceiling	22,000ft	18,000ft
Take-off, full load, S.L.	190 yd	280 yd
Take-off distance, full load, 6,000ft, 100 deg F.	400 yd	725 yd
Tare weight	1,600lb.	1,408lb
Payload	925lb	707lb
All-up weight	2,905lb	2,280lb
Power loading	11.6lb/b.h.p.	16.1lb/b.h.p.
Wing loading	19.0lb/sq ft	14.9lb/sq ft



Recently, as a result of an anticipated increase in cost which follows the price increase for Gipsy Queen 31 engines, it was decided to work out details of an alternative version of the Satellite to be powered with a Gipsy Major 10 engine. It seems that it will be possible to produce this lower-powered version for £2,500 or £1,000 less than the Queen-powered type. Comparative weights and performance figures for the two are given herewith.

There is little or no practical experience with welded magnesium alloy structures for aircraft on which the makers can draw, and the behaviour of the Satellite will be awaited with the greatest interest. A noteworthy example of weight-saving in this aircraft is the 7 ft airscrew drive shaft, which without its couplings weighs only 5¾ lb.

CIVIL AVIATION NEWS

This photograph of the prototype Ambassador was taken during flight tests which after some delay are again progressing. The aircraft has been undergoing resonance tests.

Criticisms from the Pilot's Association : I.C.A.O. to Discuss Temperature Accountability : Belgian Service to Australia

I.C.A.O. MANUAL

THE International Civil Aviation Organization has issued a manual for reference in the air and on the ground, covering the North Atlantic routes. Known as the I.C.A.O. Regional Manual North Atlantic, it contains necessary information for operations in the North Atlantic area including navigation, communications, search and rescue and meteorological facilities. The characteristics of airfields and marine airports suitable for international use are included and examples of instrument approaches and landing procedures for use in bad weather conditions are given. A section is devoted to procedures, and the technical organization in existence and responsible for the control of air traffic on the North Atlantic routes, which, in fact, supplements the standards and practices already recommended by the Organization.

Facilities and procedures are constantly changing and the manual will require constant amendment. All purchasers of the manual will in consequence receive amendments from the I.C.A.O. containing information which has been extracted from *International Notices to Airmen*. The manual is the first of a series of such publications planned for each of the I.C.A.O. regions and when the series is completed it will make available, in concise form, essential information for flying in most parts of the world. It is understood that the next manual will cover the European-Mediterranean region.

B.A.L.P.A. OBSERVATIONS

THE Air Safety and Technical Committee of the British Air Line Pilots' Association has commented on the report of the accident to Rapide G-AFFF which occurred on September 27th, 1946, near Renfrew. A report of the accident appeared in *Flight* dated May 8th, 1947. The committee was unable to find serious fault with the conclusions of the Inspector of Accidents, but considers it unlikely that the pilot of the crashed aircraft mistook the bearings given to the other aircraft for his own; it was, however, a possible assumption. The committee did consider that there was lack of control in that two aircraft were allowed to fly blind and at a low level on various headings in the immediate vicinity of Renfrew. In view of the risk it was thought that Captain Stephens might have been anxious to break cloud. It was considered that the controller should have passed a safe height to fly, although, as the committee pointed out, at Renfrew even if control had arranged separation there was no satisfactory method of accurate navigation. The committee considered that ground facilities at Renfrew were inadequate and out of date, in fact, showed little improvement on the practice of fifteen years ago, and made the observation that there had been no improvements in aids since the accident had occurred. The inadequacy was matched, in the opinion of the committee, by the out-of-date airborne equipment and weather reporting facilities. An urgent recommendation was made that additional radio aids should be provided on the ground and on Rapide aircraft to afford more than single channel working, some kind of airborne navigational equipment, and that a ruling should be made to forbid aircraft being flown for hire or reward unless equipped with those minimum radio aids.

ACCIDENT REPORT

A REPORT from the Chief Inspector of Accidents dealing with the accident involving the B.O.A.C. "Dove," G-AHRA—which crashed at Chewton Common, Highcliffe, Hants, on March 13th—has been published.

The flight was planned to obtain fuel consumption figures of the Gipsy 70 engine under cruising conditions, and Capt. R. G. Buck, the pilot, took-off from Hurn Airport at 1620 hours, his intention being to carry out a flight of one hour's duration below the cloud which was then at 1,200ft. No notification of the flight was made to flying control until the time of take-off and no weather forecast was requested or given. It is presumed that the test was satisfactorily concluded, for at 1714 hours the Captain requested permission to join the circuit prior to landing. This was given, together with weather information and Q.F.E. Weather conditions then commenced to deteriorate rapidly, cloud base lowering to 800ft with rain.

Capt. Buck gave his position as "over Bournemouth Pier" at 1724 hours, and he was instructed by control not to fly above 1,500ft owing to the presence of another aircraft at

Civil Aviation News . . . . .

2,000ft. Rockets and Very lights were fired and at 1735 hours the pilot announced that he could see the airfield. He immediately carried out a left-hand circuit at an estimated height of 200ft with the undercarriage down, at times going out of view into low cloud and rain. An approach at about 50ft on runway 170 was attempted, but the pilot failed to line-up with the runway and passed over the centre of the airfield and disappeared in a right-hand circuit.

After a similar unsuccessful attempt to land, the Controller gave permission for landing on any runway and gave further assistance by lighting "lead in" and "lead out" sodium funnels. Capt. Buck then asked for a diversion stating "no radio, VHF not working and endurance three hours." At 1804 hours he was told the best weather was in the London area and that London Airport had G.C.A. and could work him on 5,100 kc/s. This suggestion was not acted upon, so the Controller proposed he should make a further attempt to land at Hurn. Capt. Buck's reply was "Do not know where I am, but will try to find you." At, approximately, 1808 hours the aircraft struck a row of trees and crashed in an adjoining copse. Weather conditions were bad with fine drizzle, a cloud base of 60ft and visibility down to as little as 200 yards.

In the opinion of the Inspector the accident was the result of the aircraft striking trees whilst flying low in conditions of poor visibility. The only recommendation made was that the present location of the inertia crash switch be reconsidered. Owing to the high inertia required to actuate this switch it was felt that a position such as the belly of the fuselage adjacent to the nose of the aircraft would be more desirable.

TEMPERATURE ACCOUNTABILITY

AT the I.C.A.O. Airworthiness Division meeting in Montreal last March, a recommendation was made that a special committee should be set up to study the question of temperature accountability, this being the term used to denote the effect of atmospheric variation on aircraft performance. Committees of the Airworthiness and Operations Divisions will meet to discuss the question in Paris on September 23rd. The importance of ambient condition variation has become of first magnitude since the effect on an average four-engined aircraft of an increase in temperature of 10 deg F is to reduce the lifting power by about 2,000lb. Put another way, this could mean a take-off overload of a ton, with consequent risk of running out of runway. The meeting will consider what safety standards should be adopted to guard against accidents due to temperature accountability, and what changes should be made in the international standards to take into account the actual load conditions at the time the aircraft is operated.

DELIVERY FLIGHT: Just before the take-off of a Dakota sold by R. K. Dundas Ltd. to Dalmai Jain Airways of Calcutta. Mr. Peter Holmes, on the left, is a director of the London School of Air Navigation. He intends to investigate in Calcutta and Bombay the possibility of starting Navigation Schools in India. The rest of the crew are (left to right), P. Carpenter, Flight Engineer, J. M. Fowle, Radio Operator and A. D. Duncan, aviation manager of R. K. Dundas Ltd.

AURAL STANDARDS FOR PILOTS

AIR Navigation regulations now include a waiver clause to the effect that when the holder of a licence who is required to satisfy the Hearing standard No. 1 fails to satisfy that standard but is able to satisfy Hearing standard No. 2, and in the opinion of the Minister his flying experience, ability and judgment compensate for his hearing deficiency having regard to the nature of the equipment he is required to operate, the licence may be renewed subjct to such limitations as the Minister may consider appropriate in the circumstances of the case.

The proposed No. 1 Hearing standard is that the applicant must not have a loss in either ear of more than 20 decibels at any one of the four frequencies 512, 1,024, 2,048 and 4,096 cycles per second. The proposed Hearing standard No. 2 is that the applicant must not have a loss in either ear of more than 20 decibels at any one of the three frequencies 512, 1,024 and 2,048 cycles per second.

BRUSSELS–SYDNEY BY LODESTAR

BELGIAN AIR TRANSPORT S.A., operating from Melsbroek, are flying four scheduled services each month along the Nile Valley to Stanleyville, making stops overnight at Tunis, El Adem, and Khartoum. The company was formed by M. Vanbuimbroek, the managing director, with an Auster and a Proctor, but three Lodestars are used for the African service. The company now intends to open a service on similar lines to Sydney, making night stops at Athens, Basra, Karachi, Calcutta, Singapore, Koepang and Port Darwin. Other stops will be made for refuelling.

The first flight is to be made on November 1st, and subsequent flights have been scheduled to leave Brussels on the 1st of each month. The frequency will be increased when more Lodestars are available and when the Skymasters, now on order, are delivered. The Lodestars will carry only twelve passengers in order to permit a luggage allowance of 85lb for each passenger. The pilots are Belgians who have served either with the R.A.F. Transport Command or with air lines. The inclusive fare from Brussels to Sydney is £300.

BREVITIES

AN A.B.A. Skymaster recently flew on a survey flight from Stockholm through Geneva, Rome and Lydda to Teheran. The company intend to fly scheduled services along the route with Skymasters until the new DC-6s are delivered.

* * *

Pan American Airways flew across the Pacific and in Alaska during June this year 10,648 passengers, against 5,656 in June, 1946.

* * *

The Martin 202 has been approved by the Civil Aeronautics Administration for airline service. The type thus becomes the first American post-war twin-engined airliner to be so certified.

* * *

The C.A.B. have authorized K.L.M. to continue services between Amsterdam and New York, with intermediate stops in the U.K., Eire, Newfoundland and the Azores.

* * *

Peruvian International Airways have been authorized by the C.A.B. to fly passengers, freight and mail between Lima and Montreal, through Balboa, Panama City, Havana, Washington and New York.

* * *

The first Bristol Freighter for the Swedish air charter Company A.B. Trafik Turist Transportflyg arrived in Stockholm on August 6th carrying a Bristol motor car. The Freighter has been named *Mercurius*.

* * *

Subsequent to a recent visit to Prestwick by the Deputy Master and Secretary General of G.A.P.A.N., it has been decided to form there a Scottish branch of the Guild. It is to be known as the West of Scotland branch.

* * *

Australian air navigation regulations have been revised to give effect to the I.C.A.O. recommendations. Flying training schools will be granted licences only if they comply with the standards of equipment and instruction as laid down. Organ-

Civil Aviation News . . . . .

izations engaged in charter flying, aerial survey work, crop dusting, seed sowing and advertising will require licences after the regulations come into effect on January 1st, 1948.

* * *

The Latécoère 631 took off from Biscarosse on Friday, August 22nd on the first Air France service to the Antilles. M. Jules Moch, the French Minister of Transport, has flown out in the flying boat to study the possibilities of an extension of the line to South America.

* * *

Qantas are to take over the Sydney-Tokyo service now organized by the R.A.A.F. It is understood that Qantas will use the Skymasters which will be taken over from T.A.A. when that company receives the Convair 240s now on order.

* * *

A new weekly air service from Beirut to Athens, Rome and Marseilles has been opened by Middle East Airlines. Aircraft take off from Beirut each Thursday. Lebanese transit visas for passengers from Palestine can be arranged by the company, which has also opened a regular weekly connection between Beirut and Ankara.

* * *

Tests with the prototype Boeing Stratocruiser have continued since the initial flight on July 8th. Maximum take-off weight has not yet exceeded 125,000 lb, which is 10,000 lb less than the normal gross weight. The service ceiling and maximum speed nave not been determined, but the Stratocruiser has been taken higher than 20,000ft, and has reached speeds in excess of 300 m.p.h.

* * *

A direct service between the U.K. and Iran was opened by B.O.A.C. on August 25th. The route will be flown by Dakota aircraft through Marseilles, Rome, Athens, Nicosia, Lydda and Baghdad to Teheran once each week, leaving London Airport on Mondays and arriving at Teheran on Wednesdays. The return service will leave Teheran on Thursdays and arrive at London Airport on Saturdays. Night stops are scheduled to be made at Rome and Lydda, and the fare will be £90 single and £162 return.

FROM THE CLUBS

THE Cowes Aero Club is organizing an Air Rally to be held at the Cowes Airport on September 7th. The Rally will include flying demonstrations and competitions, glider-flying and aerial tours of the island. Mr. Rex Young is planning to make what is believed to be the first crossing of the Solent by glider during the day, and he will later give an exhibition of glider aerobatics. Flying clubs have been informed of the Rally and a good attendance is forecast. Full servicing facilities, including complete overhauls and C. of A. renewals, are available at Cowes, and a comfortable club house offers food and drink to members and their guests. A dancing and games room which has recently been opened is proving to be a popular addition to the club.

* * *

The Home Counties Flying Club, like all other clubs, was, of course, closed down at the beginning of the war. It has now, however, been tentatively re-established at Willingale Airport, under the auspices of Straight Aviation Training, Ltd. A certain amount of navigation training is carried out and a fly yourself hire service is to be opened. Willingale was a wartime American bomber station, and it did not lend itself to conventional club facilities. However, it was felt that in view of the existing organization there, the restarting of the club was worth while. Five aircraft are operated, one de Havilland Hornet and four Fairchild Argus, and the majority of the work consists in allowing members to use the aircraft on the fly yourself hire basis. The club has a membership of between 140 and 150 people at the present time, and it is hoped that this figure will be increased shortly.

* * *

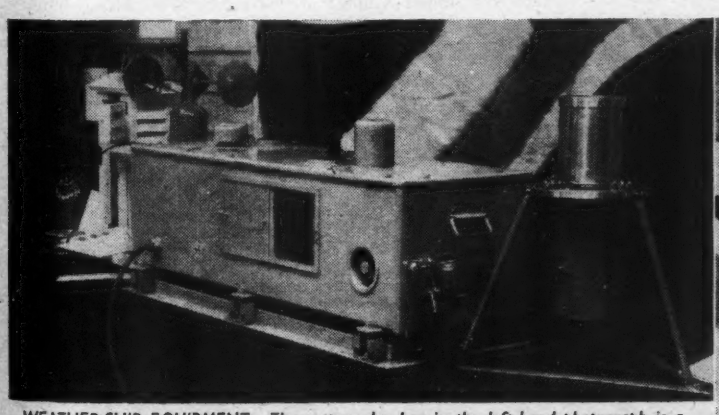
In New Zealand plans are being prepared for an air race to be held there next February. It will be a handicap race for light aircraft flown over a 1,000 miles' course around the South Island of New Zealand. It has been proposed that the winner shall receive £500 and a cup, and that £200 and £100 respectively shall go to the pilots placed second and third.

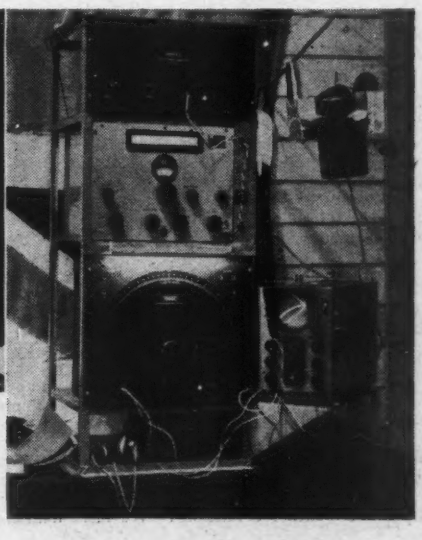
* * *

Two hundred people attended a cocktail party held at the Reading Aero Club recently. Membership of the club, which re-opened during June, continues to increase, and the aircraft have been kept busy during the good weather. Many members of the R.A.F. have joined the club, and some of these are obtaining their "A" licences through the R.A.C.

* * *

The first post-war "At home" to be held by the Midland Aero Club took place last month under perfect weather conditions. An arrival competition was won by Mr. W. Lawton and the "Cecil Kay Trophy," presented by Mr. Cecil Kay for the pilot who flew the longest distance to visit the club, was won by Commander M. Banks, who flew 287 miles to attend the rally. There were several competitions during the afternoon, including a precautionary landing competition in which machines had to land over a tape which was 5ft from the ground. Mr. P. Adams, test pilot of Dunlop's Aviation Division, and Mr. D. G. Duval, of Patrick Duval Aviation, indulged in some crazy-flying in the club's Tiger and later, Mr. D. G. Duval won the Dunlop Trophy with his display of aerobatics. The prizes and trophies were presented by the wife of the chief instructor, Mrs. Douglas Scoffham who congratulated the pilots on their enthusiasm and keenness. The Midland Aero Club are hoping to organize an Air Rally on ambitious lines next year.





WEATHER-SHIP EQUIPMENT: The rectangular box in the left-hand photograph is a loofah type visibility meter. Air which passes through the grille in the side is illuminated and compared, by observations through the eyepiece on the top, with a variable filter of known capacity. Leaning on the nearest end is a hand anemometer, and on the stand is a gimbal-slung rain gauge. The photograph on the right shows the equipment used to plot the track of, and measure the readings from, radio sondes, one of which is shown.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

HELICOPTER PRICES

Comparison of American and British Costs

IN the issue of July 17th an excellent review is given of helicopter topics. This article quotes the price of the Sikorsky S.51 helicopter as being £12,000, approximately, in U.S.A., and also assumes the cost in this country to be in the region of £20,000.

The American cost of the S.51 helicopter has not been as low as the figure mentioned, and has risen substantially, and in fact the last figure we had was $75,000, which is £18,750. With the continuous increase of costs in America it may be that this figure will go up. The original lower prices in America were influenced by reason of the fact that surplus war material was used extensively, and there are also other causes with which we will not burden this letter.

It is frequently said that the cost of manufacture in this country should be lower than it is in America, although there is plenty of evidence to the contrary. The cost of manufacture in the two countries depends on a number of items, amongst others being the volume of production, and it will be agreed by most manufacturing engineers that, other things being equal, this country can be competitive.

In the case of the helicopter, it remains to be determined what will be the scale of production in this country, and with the present difficulties the scale of production will depend as much, if not more, on the possibility of obtaining supplies as it will on sales.

It is reasonable, however, to assume that the cost of manufacture during the next few years, bearing in mind the great difficulties which exist, are not likely to be less than they are in America, this applying to helicopters as well as other engineering products.

A. H. WILLIAMS,
Commercial Manager, Westland Aircraft, Ltd.

From Sir Alan J. Cobham, K.B.E., A.F.C.

FLIGHT REFUELLING

A Statement on the London-Bermuda Trials

THE paragraph in "Outlook," *Flight*, August 21st, presented a fair assessment of the objects of the flight refuelling proving trials just completed on the London-Bermuda run. I have been developing and actively promoting the principles and practice of flight refuelling for over fifteen years, and, as the Editor remarked, I am more than pleased with the results of the trials. We set out to prove three contentions. (1) That a scheduled airliner route could be flight-refuelled efficiently with no delay in the schedule. (2) That long-distance non-stop flights, that were impossible for any existing type of airliner, could be made possible—and profitable—by flight refuelling. (3) That it was possible to develop a foolproof and weather-proof method of interception.

In the early stages certain novelties were introduced in the methods of interception, but in the later stages the system had been adapted to requirements and perfected in application. In fact, the senior radio officer of B.S.A.A. could suggest no further improvements. His report on the last flight west stated that "Radio troubles first encountered just don't exist."

In all, twenty-two flights were made. The only occasion on which the flight refuelling operation was not carried out with complete ease and success was on the fifth trip eastwards, when the receiver aircraft was forced to land at Santa Maria owing to engine trouble.

The fact that the aircraft concerned were converted military aircraft operating on flights of thousands of miles over the sea, makes even more creditable the servicing carried out through the whole series by Flight Refuelling Limited, and the degree of reliability experienced shows that this servicing was up to the high standards demanded by B.S.A.A. The converted Lancasters used as tankers and based at Santa Maria were also serviced by us, and the base itself was installed, manned and operated solely by personnel of the firm. The base was established at short notice and in quick time and an efficient system has now been created for the rapid establishment of a tanker base as well as developing a completely efficient system of refuelling in flight.

As pointed out in the *Flight* editorial, the proving trials on the London-Montreal run with B.O.A.C. will present us with all the problems of maintaining the service under the worst possible weather conditions. We have demonstrated in many trials during the last two years, that the operation can be carried out in any weather conditions in which an airliner can be flown. I am confident that with the co-operation of B.O.A.C., we shall be able to overcome any difficulties which may arise. There is no reason to believe that this series will be less successful than the series just completed, and the results should finally establish both the efficiency and efficacy of the system of flight refuelling.

ALAN J. COBHAM.

ELEMENTARY TRAINERS

Starting at First Base

I AM glad to see that at least one correspondent, Donald McKay, agrees with me to some extent on the subject of elementary trainers. His mention of the reduction of accident proneness in later life resulting from learning to fly on a relatively complicated aircraft brings up a new point. I may say at once that I believe such a theory to be rot, and that assuming a pilot has reasonable training on any aircraft, accident proneness later is entirely a matter of the man rather than the machine.

During the war the Reid and Sigrist trainer, nicknamed the "Snargasher," was tried out as a combined elementary and intermediate trainer in the hopes of reducing the time taken to get a pilot recruit to O.T.U. stage, and although nothing came of the experiment I believe it was regarded as fairly successful. However, I think at that period expense was of little importance while time counted for everything. If one unit and one type of aircraft could do the job of two of each it was a case of "damn the expense—give the cat another goldfish!" Even now I understand that R.C.A.F. pupils are being taught to fly on Harvards, but this is probably because there are very large numbers of Harvards immediately available to train a comparatively small number of recruits, and it is cheaper to use these than to buy expensive new trainers of a more elementary character.

I hold nothing personal against the Prentice but I am still hoping somebody will tell me what considerations led to the new elementary trainer specification.

ONE-TIME A.2.

PRELUDE TO GLORY

The Real Reason for the Arnhem Failure

GROUP CAPT. NEWNHAM would seem to think that the failure of the 1st Airborne Division at Arnhem was because the paratroops were dropped by day. I don't agree with this. Even if the landings had been made on the blackest of nights the final outcome of the Battle of Arnhem would have been the same. No paratroops could have dropped with the necessary aids for a night landing by gliders (oh yes, there *were* a few gliders there), as a landing in the close country around Arnhem needed second sight even by day.

The real reasons for the Division's failure were the obvious ones. (1) The failure of the 2nd Army to fight through to Arnhem. (2) The failure to withdraw the entire Division (or what was left of it) on the Thursday when it would have been possible to fight *back* to the 2nd Army. It was obvious, even to the dimmest intelligence, that the 2nd Army wouldn't fight through to *us*. (3) Bad intelligence and worse briefing. We were told that there was no enemy armour in the area—when actually they had a Panzer Division and lashings of S.P. 88 mm guns. We were briefed to go in at under 1,500ft because "There is no light flak in the area." No light flak! Ye Gods! (4) No air support once the Division was "in."

To the oft-repeated excuse of bad weather I can only say "phooey!" The weather was almost as good as the present heatwave—it only rained once during the whole engagement—and it was certainly good enough for the Luftwaffe. In fact, had the second lift been ten minutes earlier *or* half an hour later the gliders would have been caught over the DZs by a mixed bag of F.W.190s and Me109s who, incidentally, carried out several repeat performances.

While we are on the air side, I would like to say that we got far more of the two "resupply drops" than has ever been admitted, even containers stuffed with red Airborne berets.

In closing there is one question to which I have never been able to get an answer. Why were *two* divisions sent to Nijmegen, which was an obvious "piece of cake" from the start, and only *one* division sent to Arnhem, 50 miles farther on into enemy held territory?

GEOFFREY MOSS.

SERVICE AVIATION

"Flight" photograph

HIGH-LIFT DEVICES: The lift-flaps and slots of the Heston A.O.P. aircraft shown extended. Also in the photograph can be seen the wide extent of the clear vision cockpit, the air intake trunk and the long travel undercarriage legs.

Target-towing Tempests

IT is proposed to convert fifty or so Tempest Vs into two-seat target-towing aircraft, probably for use in the Middle East. The machines are to be powered by Napier Sabre IIcs. Work has already started on the first aircraft and when the final form has been approved conversion of others will commence. Mk. VI Tempests with Sabre VA engines are already giving good service in the East.

"Winston's Own"

NO. 615 (County of Surrey) Squadron, A.A.F., the Hon. Commodore of which is the Right Hon. Winston S. Churchill, is about to recruit a second flight, and intending volunteers should make early applications for the limited number of vacancies. The squadron is commanded by S/L. Ronald Kellett, D.S.O., D.F.C., who frequently led the Northolt Wing in the Battle of Britain and commanded the famous No. 303 Polish fighter squadron.

Battle of Britain Abbey Service

A SERVICE of Thanksgiving for victory in the Battle of Britain will be held in Westminster Abbey on Sunday, September 21st, at 3 p.m. The preacher will be the Rev. F. R. Robarthan, O.B.E., Vicar and Rural Dean of Brighton, who took part in the Dunkirk evacuation. He was awarded the O.B.E. after D-Day for his services as Acting Chaplain General along the invasion forces' lines of communication.

Units of the R.A.F., W.A.A.F., A.A. Command, R.A.F Association, Princess Mary's R.A.F. Nursing Service and the Royal Observer Corps, will march to the Abbey for the service after parading at Wellington Barracks. The R.A.F. Central Band and Trumpeters will be in attendance. During the service the R.A.F. Ensign will be presented to the Dean, who will lay it on the High Altar, where it will rest as in the dedication ceremony of the Battle of Britain Chapel. An R.A.F. Ensign will also be flown from the tower of the Abbey.

Tickets of admission to the service are obtainable by parents and widows of Battle of Britain aircrew, retired R.A.F. officers, and Battle of Britain aircrew, but not more than two for each applicant and only from the Under Secretary of State for Air, (S.4) A.M., Whitehall, S.W.1, not later than September 6.

Royal Air Force and Naval Air Arm News and Announcements

W.A.A.F. Athletics

THE first women's Inter-Service Athletic Championship will be held at R.A.F. Station Uxbridge, on September 3. Olympic Sports scouts made at least one "discovery" at the W.A.A.F. Inter-Group Athletic meeting at Uxbridge on August 15, where both track and field events reached a high standard.

In the high jump, Sgt. Margaret Ring, representing B.A.F.O., cleared 5ft 4in

IN ENGLAND NOW: Air Marshal G. Jones, C.B., C.B.E., D.F.C., who is C.A.S. of the R. A. A.F., is visiting Britain. He is shown here during a trip to Bristol's. With him is Dick Northway (Assistant Chief Test Pilot) and W/C. H. A. Conaghan, (Staff Officer R.A.A.F.)

Service Aviation . . . . .

without any previous faults and then stopped. She has been training at the Olympic Stadium in Berlin and may be a serious contender for Olympic Honours. F/O. Billers, representing Maintenance Command, won the 60 yards heat and final in 7.2 and 7.7 seconds respectively, and went on to win the 220 yards and the long jump.

For Artillery Observation

THE new Heston A.O.P. is completed and nearly ready to fly. The specification which it fulfils calls for an aircraft with an exceptional field of view, good handling qualities at low speeds and short take-off and landing runs. It must be able to carry out its artillery observation duties by day or by night in any part of the world.

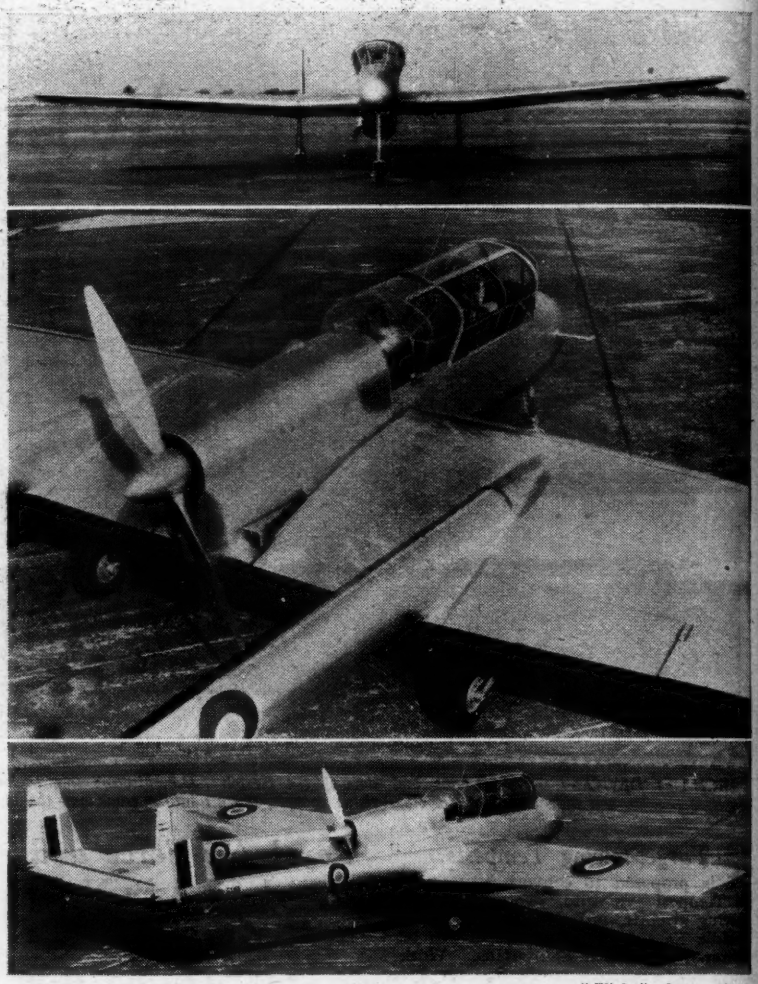
To obtain the exceptional view, a pusher airscrew arrangement has been adopted and the crew's stations are forward of the leading edge. By keeping the lower half of the cockpit narrow and bulging the canopy sides outwards, it has been found possible to get an uninterrupted view upwards, sideways and downwards for the whole 360 degrees of the circle. The steep angle on the nose gives the pilot ample vision forward and downward, and the observer, facing aft, can see well over the sloping cowling of the Gipsy Queen engine.

Large slotted flaps and full-span leading-edge slots have been fitted to help in obtaining the requisite flying characteristics. The outer sections of the leading-edge slots, corresponding with the span of the ailerons, are fully automatic, the remaining sections are coupled with the flaps and extend fully when the flaps are moved into either the take-off or landing position.

It is thought that this high-lift system is near the optimum for take-off purposes. Higher lift coefficients would result in increased drag, sufficient to affect the take-off run adversely.

In the interests of durability, and of suitability for use in any climate, the Heston A.O.P. is of all-metal construction except for fabric-covered control surfaces. A very light skin of Alclad is employed elsewhere.

For the particular uses to which the Army may have to put such a machine, its serviceability is increased considerably by the fact that it is designed to be dismantled quickly into small, self-contained units for ease of transport by road.



"Flight" photographs.

TO FIGHT LAND BATTLES: From the frontal aspect the Heston A.O.P. aircraft is very neat and clean when all the flaps and slots are tucked up. The D.H. Gipsy Queen engine (240 h.p.) has an extractor fan to induce an airflow while the aircraft is stationary or flying slowly. This is necessary owing to the absence of slipstream. The layout of the tail is such that the observer's field of view backwards suffers the minimum obstruction.

4,400 A.T.C. Cadets Fly

ON Sunday, August 31, the instructors of No. 65 Group (London area) R.A.F. Volunteer Reserve Flying School at Fairoaks, Surrey, will have completed 2,208 flights with cadets of A.T.C. units which have been attending a week's annual camp successively throughout the summer at Thorney Island, near Portsmouth. Two out of six instructors have each been making twelve 20-minute flights, six in the morning and six in the afternoon, every day since the scheme began early in June. The group's other reserve school at Panshanger, Herts, No. 1 R.F.S., also adopted a similar A.T.C. flying commitment, so that between them the two London area schools will have provided flights for some 4,400 cadets during their annual camp.

In addition to this programme, the instructors at Fairoaks are giving week-end flights to A.T.C. cadets at Hendon, Kenley, Biggin Hill, Northweald and at Fairoaks itself, but these are now being limited since the instructors are becoming very busy giving flying training to the growing number of R.A.F.V.R. pilots who are joining the school. Week-end flights are also being given to the A.T.C. by other Reserve centres which are open. For example, No. 8 R.F.S. at Woodley, of 62 Group (S. and S.W. area), has been sending instructors to Weston-super-Mare, Andover and Little Rissington.

Kenley Sector Reunion

ALL ranks, both R.A.F. and W.A.A.F., who served at the R.A.F. Stations Kenley, Croydon, Redhill, Gatwick, Shoreham and Friston, are reminded of the reunion which is organized for 2.30 p.m. on September 20th at Kenley airfield. Particulars may be had from W/C. A. Holmes, 11, Court Hill, Sanderstead, Surrey.

D.A.F. Reunion at Albert Hall

A REUNION of Western Desert and Desert Air Force personnel is to be held at the Royal Albert Hall, London, on Saturday, September 20. It is hoped that some 6,000 serving officers and men of the Desert Air Force will be present, including naval, air formation signals and airfield construction personnel who served alongside the Desert Air Force between 1940 and 1945. Tickets are 5s each and the programme will include a full musical and variety programme, community singing, and a stage and radio star cabaret. Fully licensed running buffets will be available. The doors will be opened at 6.15 p.m. for 7 p.m. Admission will be by ticket only, obtainable from:— The British Legion, 49, Pall Mall, S.W.1, or branches; the R.A.F. Association, 83, Portland Place, W.1, or branches; or The Joint Secretary, Desert Air Force Reunion Committee, c/o D. Admin. Plans, Air Ministry, King Charles Street, S.W.1.